Electrical World

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For Greater Progress!

To make two kilowatts grow where only one grew before is, in the fewest possible words, the purpose of the Society for Electrical Development, whose inaugural sessions we report at length this week. It is characteristic of the spirit responsible for American industrial growth that the electrical industry should not be satisfied to double upon itself every five years, but should get together in an effort to make its growth at the rate of 100 per cent every two and one-half years—or less! It was evident throughout Tuesday's and Wednesday's sessions that the society has within itself the ideas backed by the determination and resources necessary to accomplish great good. As a means for the correlation and acceleration of all forces now working for electrical progress; for carrying the gospel of electricity to all the people; for inculcating sound ideas on questions of public policy; for the education from within of every department of the industry in its greater opportunities; for the elimination of the unhealthy practices which have mainly developed in distribution, and for getting everybody to work, the society has not merely justified its existence; it has shown even in the first hours of its birth the promise of a giant's strength.

Electrical Exports for November

The figures of electrical export for November, 1912, would indicate a maintenance of the tendency to expansion of foreign trade. The total given for the month is $2,270,553, as compared with $1,679,566 in November, 1911. The totals for the eleven months of the last three years range as follows: 1910, $15,528,304; 1911, $17,276,323, and 1912, $21,026,549. Here is evidence of a marked gain which the figures for December should only accentuate. As has been remarked already in these columns, the details of the statistics are not such as to help one in useful comment or criticism, but after a time the new data in the new shape may render the reports from the Bureau of Foreign and Domestic Commerce valuable. Still, when one-half of the total is merged in "all others," it is hard to offer any opinion that would be of much weight as to the relative importance of various branches or the unsuspected opportunities that might lurk in business still to be worked up from an undeveloped state. The month's importation of arc lamps is given as 270, with a value of $3,957. The number of incandescent lamps, carbon type, was 352,110, valued at $20,579, and of metal-filament lamps 312,146, valued at $23,926. There are no figures of comparison with previous months nor with previous years; but for the eleven months of the year the importation of arc lamps was 1015, valued at $16,088; of carbon-filament lamps, 796,562, valued at $52,666, and of metal-filament lamps, 1,505,782, valued at $136,755. Those prices look pretty low, especially for the metallic-filament lamps, but may herald the glad time of lower cost of living electrically when the new President and the new Congress get through with the tariff.

A Railway's Electrical School

Several years ago the Pennsylvania Railroad Company began planting trees from which the road's supply of ties might be drawn in years to come. Following the same wise policy of prevision, this company has established a correspondence electrical school to train the men from whom it will draw the crews for its electric trains and the workers who will be responsible for the shop maintenance of these trains. It would be hard to find evidence more suggestive than this of the imminence of the day when, in the opinion of the officers of one of our most progressive transportation systems, electrification will spread far beyond terminal districts and supplant the steam locomotive in trunk-line operation. Sooner than many even of the electrical fraternity realize, electric trains will be running between New York and Washington, D. C. It is because the railroad does realize this that it is planning to educate its present employees—not those of the next decade—in at least the fundamentals of electrical engineering. Meanwhile there are so many uses of electricity on roadway and train and in shops that, whatever else a railway man is, he should be something of an electrician and familiar with things electrical. Looking at it, then, either as a sign of the near approach of the long-prophesied era of steam railway electrification or as significant of the progress already made by electricity in steam railroading, the establishment of the Pennsylvania's school is an incident from which the imagination can easily draw a mental picture of the time when electricity will be doing as much in the heavy transportation work of the world as it is now doing in other major departments of industry.

Sleet Loads on Overhead Wires

A note in another column in reference to data concerning sleet loads gathered from the results of a storm in Oregon adds to the rather meager information on the subject. Sleet storms do not occur with great frequency, and opportunities for securing accurate data are not numerous. Moreover, the period for observation is usually short, because the sleet seldom remains for many days. The opportunities for useful research in this field are very large and we encourage engineers to take it up. The only expensive equipment needed is a good camera; for the rest a tape line, a wire gage and a notebook are the chief essentials. The conclusion reached by Mr. W. R. King, that the

accumulation of sleet can be said to be a function of the wire diameter, seems to us to require further investigation and corroboration. In the first place his formula takes no account of the total sleet precipitation on a horizontal plane, which is no more the same in two different storms than the rainfalls in two cases would necessarily be alike. Moreover, the precipitation during any given storm varies at different places, and the critical temperature at which sleet forms is not likely to exist simultaneously over wide areas. It seems logical that the total precipitation, at least, should appear in the formula. Mr. F. F. Fowle some years ago deduced a theoretical formula showing that the radial thickness of sleet accumulation on a cylindrical wire would be at the most 32 per cent of the precipitation, but this needs experimental verification. In fact, the whole subject needs careful investigation.

Energy Transmission for Pyrenees Railway

We give a brief account this week of a plant for railway electrification in the French Pyrénées which includes some rather unusual features. The line is part of the system of the Southern Railway and is a standard-gage third-rail installation worked at about 850 volts. The road is 35 miles long, terminating near the Spanish frontier, and is characteristically a mountain road, crossing a pass in its course at an altitude of more than 5000 ft. and having maximum grades as high as 6 per cent. The generating plant at La Cassagne has a very unusual equipment in that its generating units are double-current machines feeding direct-current energy to a section of the railway directly from the commutators and also delivering three-phase energy for transmission to converter stations along the line. These generators are eight-pole machines of 650-kw rating, each directly coupled to a 1500-hp Pelton wheel through an elastic clutch. The generators are compound-wound for 850 volts on the direct-current side, and have six collector rings for the three-phase transmission at the other end of the bar-wound armature. The three-phase voltage is approximately 600, and the output of each machine is received directly on a three-phase transformer which delivers it to the line at 20,000 volts. There are five substations for delivering direct-current energy at 850 volts. Each station contains a three-phase synchronous converter receiving energy at 600 volts from a three-phase transformer. These rotaries are started as direct-current motors from the third-rail.

The transmission line is worth at least a moment's consideration because it is for the most part on pine poles treated with copper sulphate as a preservative, while the cross-arms are of creosoted oak. The only portion of the line which is not thus constructed is built of concrete poles. The use of the double-current generators has been comparatively seldom tried, although suggested a good many years ago. It is to be noted that in this instance the generators are of the interpole type, which steadies the commutation to an extent which evidently clears away many of the difficulties previously met. The commutating pole has proved itself a good thing for many purposes, of which the present example is by no means the least important.

The Acetylene-Electric Flame

It has long been known that flames are affected by both magnetic and electric fields. The actions which take place in a flame when subjected to an electric field are necessarily very complex, so that our knowledge of the effects produced has been very limited and superficial. In the article which we print this week Mr. C. F. Lorenz presents some interesting new experimental observations and deductions concerning fuel flames in general, and acetylene flames in particular, when subjected to an electrostatic field. Among other things, the increase in luminosity in an electrified flame is a curious and significant phenomenon.

Altogether apart from the question as to whether practical use can be made of the increase of luminosity for lighting, the possibilities of using such increase for the purposes of photographic measurement are suggested by the article. Oscillographs are instruments employed to record the variations of rapidly pulsating or alternating electric currents. They ordinarily employ mechanical vibrating systems of very high natural frequency. When the frequency of the alternating currents to be recorded approaches or passes the natural frequency of the oscillographic vibrator, the apparatus becomes unserviceable. Flames, on the other hand, are almost devoid of inertia, and oscillations might possibly be recorded by them at frequencies beyond those at which the ordinary oscillographs fail.

A Prussian Transmission Network

In the *Digest* this week will be found a suggestive report on a recent project of the Prussian government in the utilization of its water-powers. The region involved is one in the vicinity of Cassel and covers an area more than 60 miles in length and of two-thirds that width. Primarily the network utilizes the water-powers on the Weser. The project includes the complete supply of electrical energy to the territory mentioned from three large hydraulic stations united by a 40,000-volt transmission system, which is connected into a 40,000-volt distribution network with nearly a score of transformer stations reducing the pressure to 6000 volts for the secondary distribution.

From the hydraulic standpoint the proposition presents some difficulties inasmuch as provision at two of the three stations has to be made for large variations in head—in one case by providing turbines of special design to work on a head varying from 22 m to 41 m; in the other case by the more desperate resort of providing two sets of turbines, one for work under normal ranges of head, the other to deal with cases of extreme high water. In addition to these hydraulic stations, steam reserve is obtained at the municipal electricity works in Cassel and Göttingen, forming thus a fairly typical distribution network, with three hydraulic and two steam stations available, and deliberately designed from the start completely to cover a large territory. The project has involved considerable difficulty in working out the details on an economical basis. The complete cost of the installation runs close to $2,500,000. Financially the project had to be considered on the basis of the result, on this investment, of various possibilities of output combined with various degrees of completeness in

the initial plan. It turned out, as it usually does in such cases, that the indications favored the carrying out of the complete scheme. It is the complete undertaking, therefore, that the Prussian government is now backing, the first time that it has gone into an operation of this kind on anything like so extensive a scale. It means the general supply of electricity to a large and important territory by the organization of just such a network as has become familiar in American practice.

It is interesting to note that the project is based on a classified system of rates for various kinds of service, the list prices varying from about 3.5 cents to about 10 cents per kw-hr., the highest figure being reached for private lighting and the lowest for certain classes of motor service. The whole affair is a striking example of the far-sightedness of the Prussian government in looking after the material prosperity of its citizens, and particularly in standing behind the progress of industry even to the extent, as in this instance, of taking an exceptionally long stride in advance toward the organization of a general public distribution of electrical energy. Whether or not it will prove more advantageous than a privately owned and operated system only experience extending over several years can determine.

Standardization by the A. I. E. E.

With the rapid progress of electrical engineering, it has recently become manifest that the Standardization Rules of the American Institute of Electrical Engineers were lagging behind the vanguard. It was therefore decided that the best way to start a revision of the rules was to have a number of papers presented for discussion on proposed changes, so as to elicit all opinions and points of view. Forty-six papers were prepared, and printed in advance, in the February A. I. E. E. *Proceedings*, making a volume of nearly 700 pages. These papers were all presented and were fully discussed in three successive days, eight sessions in all being held.

The attendance at the convention was good, and the discussions were very effective. The subjects which, perhaps, attracted the greatest attention and interest were the subcommittee papers on temperatures and ratings of machinery. According to the existing Standardization Rules, the temperature of machines for continuous operation should not rise by more than 50 deg. C., under continued load, above that of a room at 25 deg. C., but should still have a margin of 15 deg. C. extra rise under two hours of overload. In the proposed new rules overload thermal capacities are not recognized. Continuous rated load is the only criterion offered for continuous-service machines. The rise of temperature of such machines is not to exceed 50 deg. C., with no correction for ambient or room temperature, provided that the latter does not exceed 40 deg. C.

The proposed new rule starts with the consideration that if treated fibrous insulation—or Class A insulation, as it is called—of cotton, treated cloth or paper is not allowed to attain the normal boiling point of water, or 100 deg. C., it will have a satisfactorily long working life. For example, the mummy cloths of ancient Egypt are sometimes found in very fair mechanical condition. Of course, mummy cloths are not subjected to a temperature of 100 deg. nor to the mechanical and electrical stresses of modern dynamo-electric machinery. Above the temperature of 100 deg. C., or 373 deg. absolute, fibrous insulations speedily degenerate, and at 125 deg. C. they probably lose their mechanical strength in a few months. Consequently, the primary requirement is not as to any particular permissible temperature rise under load, but that the maximum actual temperature shall not exceed 100 deg. C.

Even in cases where the hottest outside spot of the insulation can be identified and reached by a thermometer, the corresponding inside wall of the insulation at this point is likely to be still hotter, and it is difficult to say precisely how much hotter. It was, therefore, suggested in the subcommittee papers that 10 deg. C. margin should be allowed on fibrous insulation for the unmeasurable internal gradient, and that the highest temperature to be allowed by conventional measurements at any accessible place in a winding should be 90 deg. C. Allowing for a room temperature as high as 40 deg. C., this represents a maximum permissible temperature elevation of 50 deg. C. in the hottest spot accessible from the outside. If the room temperature should be, say, 25 deg. C., this would imply a safe margin of 15 deg. C., but no change in the rating of the machine should be made on that account.

The suggestion of ultimate temperature rating without reference to overloads seemed to meet with general approval. Differences of opinion were indicated, however, on two matters of detail—first, as to whether 90 deg. C. at the hottest outside accessible spot was the desirable limit to set, and, second, as to whether the same temperature limit should be set on converters as on generators, owing to the great differences in their respective overload demands in actual service. As regards the first point, it would, of course, be possible to select, say, 85 deg. C., as the highest temperature at the hottest outside accessible spot. If, however, the room temperature or ambient temperature of the machine may include 40 deg. C., then the rise of temperature would be limited to 45 deg. C., no matter whether the temperature in the testing room happened to be 25 deg. or 15 deg. C. This would mean that a number of machines which have been placed in steady, satisfactory service up to the present time would have to be derated and cut down in load, in order to come within the new rule thus amended. As regards the second point, it is true that in actual service some types of continuous-service machines have to be called upon for a much greater range of overload than others. Thus, while in some cases a 1000-kw machine may never be expected to supply any except momentary overloads, in other cases, a 1000-kw machine may have to carry 1500 kw for several hours. This is a matter for special inquiry in each case. Neither the range nor the period of such overloads is inherently predictable. It seems, therefore, desirable that continuous-service machines should be selected for specific duty according to their conventional rating. If a machine ordinarily required for 1000 kw may have to give 1500 kw, then its conventional rating, according to the proposed new rule, might have to be as high in some cases as 1500 kw. In other words, the purchasing engineer should provide for expected excesses or irregularities of service.

The News of the Week

Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.

Convention of Association of Edison Illuminating Companies

The next convention of the Association of Edison Illuminating Companies will be held at the Otesaga Hotel, Cooperstown, N. Y., on Sept. 8, 9, 10 and 11. The hotel is situated on Otsego Lake and is readily accessible by rail as well as by automobile through the Catskill Mountains. The president of the association is Mr. Arthur Williams and the secretary Mr. George C. Holberton, San Francisco, Cal.

Electrophysics Meeting, A. I. E. E.

A meeting of the American Institute of Electrical Engineers will be held under the auspices of the electrophysics committee in the Engineering Societies Building, New York, on March 14, at 8:15 p. m. Two papers will be presented, one on "Air as an Insulator When in the Presence of Insulating Bodies of Higher Specific Inductive Capacity," by Messrs. C. L. Fortescue and S. W. Farnsworth, and another on "The Application of a Theorem of Electrostatics to Insulation Problems," by Mr. C. L. Fortescue. The usual smoker will be held at the close of the technical session.

Industrial Lighting

At a co-operative meeting to be held in the Engineering Societies Building on the evening of March 13 the following persons as representatives of the societies indicated will present papers dealing with the general subject of industrial lighting: Dr. A. M. Alger, of the committee for the prevention of blindness and the New York Association for the Blind, on "Eye Strain and Light"; Dr. W. H. Tolman, of the American Museum of Safety, on "Mechanical Safety," and Mr. Ward Harrison, of the Illuminating Engineering Society, on "Industrial Lighting." The American Society of Mechanical Engineers will also be represented. Preceding the meeting members of the various societies will attend an informal dinner at Keen's Chop House, in accordance with the usual custom of the New York Section of the Illuminating Engineering Society.

Pennsylvania Railroad Electrical School

A free course of correspondence study in electrical engineering and associated subjects has been inaugurated by the Pennsylvania Railroad under the supervision of Mr. J. C. Johnson, superintendent of telegraphs. Although the plan was announced a little more than a month ago, the school already has more than 10,000 students enrolled. Use will be made of a series of instruction papers in pamphlet form, each covering a different field, and the course will include elementary work on direct-current and alternating-current circuits and apparatus; mathematics, mechanical and geometrical drawing; magnetism and its application to electric generators, motors, measuring instruments, telegraph, telephone, signal, lighting, traction and general electrical equipment; every-day troubles developing in each type of apparatus, and methods of locating and overcoming them.

Besides providing a means for the education of its employees in existing applications of electricity, it is understood that the company has adopted this method of training the largest possible number of its men to assume the duties that will devolve upon them when electric traction is substituted for steam-locomotive haulage. Students are invited to ask questions, and a course of supplementary reading of textbooks and periodicals is recommended. The first textbook in the educational course deals with elementary arithmetic. It will be followed by pamphlets on primary cells and direct current. Fourteen of these pamphlets, concluding with electric traction and power-plant design and apparatus, will complete the series.

Maine Association's Midwinter Meeting

The midwinter meeting of the Maine Electric Association was held at Riverton, Me., Feb. 24, with an attendance of nearly 100 members present. At the business session which preceded the dinner it was voted to include street-railway and telephone companies in the membership of the association.

Mr. Henry B. Ivers, general manager of the Cumberland County Power & Light Company, of Portland, introduced as the toastmaster for the evening Hon. W. M. Bradley. Following a brief address by Mayor Curtis of Portland, Mr. John R. Graham, chairman of the executive committee of the Cumberland County company and president of the Bangor Railway & Electric Company, in his address described the development of the electrical properties with which he is connected in Maine. The session closed with a short talk by Mr. A. W. Jordan, of the street-lighting committee of the Portland City Council.

Electrical Progress in Buenos Aires

Reporting to his home government, a British consul gives some recent information of interest about the progressiveness of Buenos Aires. He says that underground railways are about to take the place of the surface lines common to almost every street in the Argentine metropolis. The Anglo-Argentine Tramway Company has been intrusted with the preparation of plans for a tube railway from the Plaza de Mayo to the suburb of Palermo. British capital is conspicuously represented in large enterprises in Buenos Aires, but the new underground railway running under the Avenida de Mayo has been built by a German concern and will be opened to traffic shortly. According to the local newspapers, a syndicate of British, French, Belgian and American bankers has formulated a project for the building of an electric-service system in Buenos Aires for supplying electricity at rates considerably lower than those at present prevailing. A concession has been applied for which, if granted, will bring the German monopoly of the supply of electricity in Buenos Aires to an end. The proposed contract stipulates that the plant shall become the property of the government at the end of 1957. Italian financiers are also said to be endeavoring to obtain a similar concession. However, the German company, having its mains extended to every part of the city, is firmly established.

A. I. E. E. Pittsburgh Meeting

A meeting of the American Institute of Electrical Engineers will be held in Pittsburgh on Friday and Saturday, April 18 and 19, under the auspices of the new committee on the use of electricity in mines, of which Mr. George R. Wood, consulting engineer of the Berwind-White Coal Mine Company, is chairman. A number of interesting papers covering the various phases of this subject have been promised, and it is expected that an interesting discussion will take place.

Owing to the location of the meeting place in the heart of the bituminous coal-mining district, a large number of coal-mine papers will be presented. The Institute headquarters during the meeting will be at the Fort Pitt Hotel, where the sessions will be held.

Electrical Projects for New South Wales

Among the schemes under consideration by the officers of the Public Works Department, New South Wales, is a project for generating electrical energy at one of the coal fields in the southern part of the state for delivery to the populated areas not now served by the Sydney City Council. They are also considering the establishment of electrochemical industries for the manufacture of calcium carbide, cyanamide and caustic soda. At present the government has a timber depot and brick works in the vicinity of Uhr's Point, and the public works committee will be asked to consider an appropriation of $250,000 for an electric generating plant at that point to supply energy to the state enterprises. It is probable that the plant, if authorized, will be of a temporary character.

It is estimated that the demand for electrical energy by the state enterprises and by the municipalities and private enterprises in the southern area will be so great that it will be imperative for the government to take the matter in hand. The scheme just mentioned provides for the joint utilization of the state coal and water-power resources through the establishment of a generating station in each of the important coal fields and upon those streams which may be depended on to provide sufficient power to justify their commercial development. It has been proposed that the scheme be launched with the initial establishment of a large plant at some convenient point on the southern coal field, either at Picton or Wollongong. The general plan contemplates that this station would eventually be linked by transmission lines with stations at Burrinjuck, on the Shoalhaven River, and in the other coal fields. Towns along the routes of the transmission system or within reasonable distance would be supplied with service.

Niagara Power Companies Allowed 4000 Cu. Ft. per Second Addition

The full quota of 20,000 cu. ft. of water per second from Niagara Falls, which is the amount stipulated by the treaty of 1911, is now made available for the American power companies by the withdrawal of the extension to the Burton act made by Senator Burton himself on March 4. The Burton law, which has been in force several years, limited the diversion of water from Niagara to 16,000 cu. ft. per second on the American side. The international treaty later increased this amount to 20,000 cu. ft. per second, but the Burton law precluded the use of this full quantity. On March 2 the House of Representatives passed an extension to the act prolonging its tenure to March 4, 1914. In the Senate next day the resolution was withdrawn by Senator Burton, thus killing the bill and removing restrictions concerning both the water-power developed by the American plants and the amount to be imported from the Canadian side. It is understood that the power companies will at once take advantage of the increased flow available.

Baltimore Contractors Guests of Consolidated Company

The Consolidated Gas, Electric Light & Power Company of Baltimore, Md., tendered the electrical contractors of the city a banquet Feb. 28 at the Hotel Belvedere. This dinner, at which covers were laid for 100, was the first of a series which is planned by the central-station company of Baltimore for the local contractors. Owing to the illness of Mr. Douglass Burnett, Mr. R. F. Bonsall, of the Consolidated company, acted as toastmaster, the speakers and their subjects being as follows: Mr. W. D. Young, of the Electro-Mechanical Company, "The Baltimore Contractor;" Mr. Herbert Wagner, vice-president of the Consolidated Company, "The Consolidated Gas, Electric Light & Power Company;" Mr. Melvin H. Jones, Maryland statesman of the Jovian Order, "The Co-operative Movement;" Mr. Washington De Vereaux, of Philadelphia, "The Philadelphia Underwriters;" Mr. Joseph C. Forsythe, of New York, "The New York Underwriters;" Mr. B. L. Cates, of Philadelphia, "The National Contractor;" Mr. William J. Flannery, of the Baltimore Electrical Supply Company, "The Supply Man." After the banquet the diners were entertained by a vaudeville performance.

New York Subway Operating Contracts

The Public Service Commission of the First District of New York on March 4, 1913, approved the contracts with the Interborough Rapid Transit Company and the Brooklyn Rapid Transit Company for the operation of the dual subway system. The agreement provides that the city shall construct the new lines, the company to contribute not less than $58,000,000 (or one-half the total) toward construction, and not less than $22,000,000 toward equipment. The company is to get a lease of all lines for operation, including the present subway and the new lines, for a term of forty-nine years from Jan. 1, 1917, and the lease is to expire at midnight on Dec. 31, 1965. The city reserves the right to take over any or all of the lines at any time after ten years and terminate the contract. Provision is made in the contract for the temporary operation of parts of the system as soon as they are completed.

The Work of the Underwriters' Laboratories

Mr. William H. Merrill, manager of the Underwriters' Laboratories and past-president of the National Fire Protection Association, addressed the Electric Club of Chicago on Feb. 27. He mentioned the fact that the annual fire loss of the United States reaches the appalling sum of $250,000,000. It is not only "good business" but a patriotic duty to reduce this sum, for in fact everybody pays his proportion of this tax. Mr. Merrill, discussing the work of the Underwriters' Laboratories, the headquarters of which are in Chicago, said that from 15 to 20 per cent of the work is of an electrical nature. The underwriters and the men representing the various electrical societies and industries have co-operated harmoniously, in the main, and one result of their work is seen in the National Electrical Code. The rules set forth in this book are probably enforced to a greater extent than any other set of engineering specifications.

The speaker gave some attention to the labeling system

in vogue at the laboratories. These labels mean that the products to which they are attached have been manufactured in compliance with the specifications of the Underwriters' Laboratories. The manufacturer may also put out what may be termed "culls," but these will not bear the underwriters' label.

In relation to rubber-covered wire, the engineers of the laboratories are attempting a more elaborate work, endeavoring to ascertain the service value of the material in addition to certifying that it has been manufactured in compliance with standard specifications. Samples of wire used in actual installations are taken out and tested, and monthly bulletins giving reports of the results are mailed to thirty-five manufacturers. These manufacturers are marked as to merits and demerits according to the results of these tests in the field. However, identifying numbers or symbols are adopted which are known only to the individual manufacturer and to the laboratories, so that the results of the tests are not given by name but rather by the secret method of identification adopted. Ultimately it is hoped that the whole label service of the Underwriters' Laboratories will serve as a certificate that there is a certain service value in the material bearing the label, in addition to the fact now certified; that is, that the material has complied with certain specifications.

Increase in the Use of Electrical Energy in Northern Indiana

More than $750,000 is to be expended on the steam-driven electrical generating plant which is being erected at East Chicago, Ind., by the Northern Indiana Gas & Electric Company of Hammond, Ind. Construction operations have been in progress since the early part of December, and the steel work and radial-brick stack are well under way. This station is being constructed to meet the rapidly increasing demand for electrical energy from the cities and towns of northern Indiana. Since 1911 there has been an increase of 60 per cent in the electrical business of the Northern Indiana Gas & Electric Company, owing to the growth of industries in Hammond, Gary, Indiana Harbor, East Chicago, Whiting, Michigan City and other cities and towns. From this spectacular increase in the demand for electricity and from the number of industrial works which have sprung up, Manager W. D. Ray predicts that this portion of Indiana will prove a second Pittsburgh region.

The power plant will be situated at the intersection of the Calumet River and the government canal, so that it will have plenty of water for condensing purposes. It has been designed for an ultimate output of 30,000 kw, but only two 5000-kw, 60-cycle, three-phase Westinghouse generating units will be installed at first. They will be driven by two Westinghouse-Parsons steam turbines running at 3600 r.p.m. Heine boilers and Westinghouse surface condensers will constitute part of the steam equipment used.

Electricity will be generated at 11,000 volts and transmitted to the steel mills and other factories in the neighboring towns without the use of intermediate transformers except for lighting. Electricity for lighting will be stepped down through 11,000-2300-volt transformers before being sent out on the lines.

At present there is a 33,000-volt, three-phase trunk line, with an overhead ground wire running from the company's generating station at Hammond to Michigan City, a distance of 35 miles. This line supplies small towns on either side of the right-of-way. In the spring it is the intention of the company to erect wooden-pole lines extending from the new plant at East Chicago to Dyer, Griffith, Highland and New Chicago.

Several of the larger steel manufacturers using electrical energy supplied by the Northern Indiana company are already operating night and day, and special inducements, such as off-peak rates, will be offered to the other industrial concerns to bring the night load up to the day load. According to the specifications, one of the new 5000-kw units to be installed at East Chicago will be in operation about May 1, 1913.

The Electric Vehicle at Boston

At a meeting of the Electric Motor Car Club of Boston, Feb. 27, an extended discussion of the forthcoming electric-vehicle publicity campaign took place. Plans are being made for the concentration of advertising efforts under appropriations covering several months' work instead of the former policy of carrying separate displays in scattered locations.

Special efforts will be made to place pleasure-car advertisements on pages of the daily press devoted to social interests, while commercial-vehicle publicity is to be carried close to the financial pages. Mr. C. D. Marsh, New York, and Mr. O. G. Draper, business secretary of the club, emphasized the importance of "boosting" the electric vehicle without "knocking" gasoline competitors' machines. Each type, they declared, has its own field of economical service. The club's meetings in the near future will be addressed by speakers capable of bringing out actual experiences with the electric vehicle.

A campaign is also afoot to increase the membership of the organization among users of trucks and pleasure cars of this type. Public electric garages are being informed about the club and its work. A booklet of twenty-two pages has just been published listing the members and outlining what has been done at Boston in the past two years to introduce the electric vehicle. There are now 401 passenger and 240 commercial electric vehicles in service in eastern Massachusetts, excluding Worcester. The club has over 100 members, a permanent paid secretary with headquarters at 39 Boylston Street, Boston, and committees working on civic relations, rates, garages and other problems of interest to the industry.

In addition to the work already accomplished the plans of the club include the establishment of a bureau for motor-truck drivers, a bureau of information which will record data upon the details of electric cars, their mechanical construction and other points of service to electric-car owners, the establishment of a theater-district electric garage in Boston and the arrangement of New England tours and mapping of charging stations in the territory.

Ice Coating on Overhead Conductors

As a result of observations made upon ice-coated wires after a sleet storm at Portland, Ore., on Jan. 16, 1912, which brought down from 500 to 700 miles of live wire and caused the loss of from 300 to 500 poles, Mr. William R. King, consulting engineer, Portland, has arrived at the following conclusions:

Whether merely a coincidence or an exemplification of some unrecognized law cannot be definitely stated, but it is evident that some definite relation exists between the cross-sectional area of the original wire and that of the combined areas of the wire and its ice covering when the latter has been corrected for breakage and deformation. The combined areas seem to vary approximately as the square root of the diameter of the original wire.

Thus, where A represents the combined cross-sectional area of ice and wire in square inches, d the diameter of the supporting wire in inches and K a constant, we have $A = K\sqrt{d}$. The value of K was found to vary between the limits 2.640 and 2.357.

At the termination of the Portland ice storm the actual ice load carried by the wires was in close agreement with

the maximum coating, "0.5 in. thick all around the wire," assumed by the committee on overhead-line construction of the National Electric Light Association. The meteorological conditions which obtained throughout the Portland storm, although not usual, were certainly not unique. Mr. King argues that, in the light of the above data, it would appear that the maximum loading assumed by this committee may possibly be too small to provide an adequate factor of safety.

An Electric-Service Decoration

Decorative insignia to mark length of service of employees are something of a novelty among central-station companies, but the idea has been taken up by the Commonwealth Edison Company of Chicago. This company on the first of the year distributed to 935 of its employees a service badge in the form of a gold pin, which may be worn as a mark of distinction. The badge is awarded only to those who have been in the service of the company for five years or longer and, subject to that condition, is given to all employees without distinction. It is in the shape of an oval button, ¾ in. wide and not quite ½ in. high, and bears the legend "Commonwealth Edison Service," the center portion consisting of a relief representation of an incandescent lamp with rays surrounding it.

The plain badge indicates a term of service of at least five years and not exceeding ten years. Additional five-

COMMONWEALTH EDISON BADGE

year periods of service are indicated as follows: Ten years, one blue enamel star; fifteen years, two stars; twenty years, three stars; twenty-five years, four stars; thirty years, three stars and one ruby; thirty-five years, two stars and two rubies; forty years, one star and three rubies; forty-five years, four rubies. The completion of fifty years of service will be marked by four rubies and one diamond. The matter of preparing and distributing these badges has been assigned to the service annuity committee, which as soon as practicable after the first of January and of July of each year will attend to the distribution of new badges and to the addition of stars and jewels to old ones.

The badges were sent out to the employees with a letter from President Samuel Insull, in which he said that he hoped the recipients would have the same feeling of pleasure and pride in wearing the badges as he had in presenting them. On the back of each badge is the owner's name with the date when he or she entered the service.

Settlement of Mercury-Vapor Lamp and Rectifier Litigation

The patent controversies which have been pending for many years between the Cooper Hewitt Electric, the General Electric and the Westinghouse Electric & Manufacturing companies with reference to mercury rectifiers and mercury-vapor lamps have been brought to a conclusion by an exchange of licenses under the patents of Dr. Peter Cooper Hewitt, Ezechiel Weintraub, Percy H. Thomas, C. P. Steinmetz, and others. Both the Westinghouse Electric & Manufacturing Company and the General Electric Company have been licensed to manufacture mercury rectifiers. At the same time an exchange of licenses has been effected between the General Electric Company and the Cooper Hewitt Electric Company with reference to mercury-vapor lamps of all types so that such lamps, which are formally known as Cooper Hewitt lamps, may be manufactured by each of these two companies.

National Independent Telephone Convention at Chicago

A resolution that the National Independent Telephone Association favor vesting in the Interstate Commerce Commission complete powers to fix telephone rates, control competition and prevent discrimination caused a heated discussion at the sixteenth annual convention of the association, held at the Hotel LaSalle, Chicago, Feb. 18, 19 and 20. The proposed resolution was drawn up by a committee of which Judge N. G. Hunter, of Indiana, was chairman, and further authorized the association's board of directors to suggest to the Interstate Commerce Commission methods of regulation.

Mr. D. M. Neill, of Minnesota, who opposed the resolution, insisted that since the board of directors had considered it without coming to any decision, careful deliberation ought to be taken by the convention. A motion was made that the resolution be laid on the table indefinitely. Mr. H. D. Critchfield, of Chicago, said that the matter was one needing immediate attention. The present powers of the Interstate Commerce Commission, he declared, are so ill defined as to be barely subject to interpretation. He expressed the belief that public utilities ought to be regulated and governed by a commission whose duties are clearly defined. Mr. E. B. Fisher, of Grand Rapids, cited cases where the Interstate Commission regulates exchange rates in Maryland and Virginia, but said that he did not believe in the commission controlling intrastate business. Both sides of the discussion were well supported, but as matters seemed to come to no satisfactory end, a substitute motion was carried, referring the question to the incoming board of directors.

All parts of the United States were well represented at the convention. The sessions were opened with an address of welcome by Mr. Leon Hornstein, assistant corporation counsel of Chicago, who spoke in behalf of Mayor Harrison. Judge N. G. Hunter, of Indiana, responded.

President Savage's Address

The address by Mr. Manford Savage, president of the association, dealt with general problems. The lack of progress toward a general adjustment of existing unfavorable telephone conditions he attributed to the enactment of new statutes creating utility commissions whose duties and powers are ill defined. In some cases these laws are so obscurely worded as to make the best commissions proceed with extreme slowness until sure of their ground. But beyond this, it was asserted, the one thing that has prevented putting the telephone business on a better and more enduring basis generally has been the attitude of the parties most concerned toward each other. Hopes were entertained, he said, that in the near future a legislative dam might be constructed which would, to the great advantage of legitimate investors, prevent the unrestricted flow of the people's money into speculators' reservoirs in distant places. Telephone securities would then no longer have to compete in the money market with stocks on which a fictitious value is placed. There would be left in the home market, too, funds for legitimate investment, now sent to distant places, he said, by custom and by the drawing power of a gambler's percentage. The speaker believed further that no fine distinction will be permitted as to what is competition and what is monopoly.

"Would it be too drastic," asked Mr. Savage, "to amend the bankruptcy act so that if a corporation called into being under the provision of some law should be guilty of unfair competition, discrimination between individuals or communities, or any other act prohibited by law, such unlawful act or acts shall operate to declare the offending corporation an involuntary bankrupt, and call for the appointment of a trustee to wind up the affairs of the concern and sell its assets to the highest bidder and render its charter forever invalid?"

Since local ownership and operation are inseparably connected, Mr. Savage asked that Congress limit national statutes and the jurisdiction of the Interstate Commerce Commission so as to apply only to toll business and to such companies as do interstate exchange business, leaving the local exchange, the manner of its operation and its duties and privileges entirely to state regulations.

The national association, said Mr. Savage, furnishes a forum in which the best thought in the nation along telephone lines can be brought forth. He expressed his belief that the National Independent Telephone Association should take steps toward having the independent telephone business placed fully and thoroughly before Congress and other governmental bodies having jurisdiction over telephone operation. These and other matters of equal, if not greater, importance could be handled by a national association, with the sincere support of the telephone men of the country. In closing, the speaker said: "We are independent of any monopolistic control, but not independent of each other."

Committees on resolutions and on credentials were appointed, with Messrs. N. G. Hunter and W. F. Goodrich as the respective chairmen.

Telephone Service

The program of Feb. 19 was conducted by the Telephone Service Association, of which Mr. R. L. Barry, of St. Paul, was chairman. A talk was given by Mr. J. W. Callahan on the subject of the service association and its purpose.

Some conclusions from field observation were given by Mr. F. L. Eldridge, who is field manager of the Central States Telephone Service Association. He found, he said, that many companies were paying dearly for what the association was furnishing to its members without charge. Company members of this association can have the services of an engineer by paying merely his traveling expenses.

An illustrated lecture followed, by Mr. M. H. Moffett, of the National Carbon Company, on "The Manufacture and Care of Dry Batteries."

Mr. H. S. Durant, of the American Steel & Wire Company, next gave an illustrated lecture on the "Manufacture and Use of Steel Wire in the Telephone Industry." From the crude state, he traced the iron through the blast furnace and rolling mills to the wire-drawing operation and finally to the annealing and galvanizing processes.

Mr. B. W. Borton in his talk on "Advertising" said that persistent methods are necessary to get good results from advertising. Some novel and effective ways in which the independent telephone company in Chicago has increased the number of its existing subscribers were also mentioned by Mr. C. W. Winkler.

"Manufacture, Care and Maintenance of Storage Batteries" was the subject of Mr. H. M. Beck's illustrated lecture. He described the best methods of telling when the limits of charge and discharge are reached, and recommended the gravity test as the best indication for discharge. Suggestions were also given on the choice of pilot cells, when used, and on the care to be taken in order that the readings may be of value.

Because of delay in holding the election of directors, the program of Feb. 20 was late in starting. The remaining papers, on "Telephone Transmission," by Mr. R. L. Stadermann, of Terre Haute, Ind., and "Telephone Traffic," by Messrs. H. D. Stroud, Chicago, and W. F. Vivian, Grand Rapids, Mich., were read hurriedly, in order that the association business might be concluded. Mr. Stadermann's paper pointed out the places where energy losses are to be encountered in telephone transmission and suggested how these losses could be minimized by the careful choice of equipment and the right kind of line construction. He mentioned the troubles contended with by independent telephone companies owing to other companies holding the patents on loading coils.

The joint talk by Messrs. Stroud and Vivian gave an idea of how the traffic of a telephone company can be systematically analyzed and how the percentage of lost calls and lost subscribers can be cut down. The data compiled revealed that many traffic managers neglect keeping an account of overtime, the average revenue from which amounts to 6 per cent of the total long-distance revenue.

Prof. R. S. Butler, of the University of Wisconsin, followed with a brief talk on his subject, "Some Phases of Efficiency in Business."

The convention closed with the report on the election of the board of directors. Of the seventeen elected, eleven were members of the outgoing board. The officers will be elected at a special meeting of this board held in March. The men who make up the board are Messrs. J. W. Callahan, Chicago, Ill.; H. D. Critchfield, Chicago, Ill.; J. B. Earl, Waco, Texas; E. B. Fisher, Grand Rapids, Mich.; P. C. Holdoegel, Rockwell City, Ia.; N. G. Hunter, Wabash, Ind.; L. D. Kellogg, Chicago, Ill.; F. B. McKinnon, Abilene, Kan.; H. B. McMeal, Chicago, Ill.; C. Y. McVey, Cleveland, Ohio; Warren Pratt, Kenney, Neb.; G. W. Robinson, St. Paul, Minn.; Manford Savage, Champaign, Ill.; E. D. Schade, Johnstown, Pa.; W. J. Thomas, Shelbyville, Ky.; H. C. Todd, Marysville, Mo., and Richard Valentine, Janesville, Wis.

Nearly 400 attended the convention banquet held at the Hotel LaSalle, Wednesday evening, Feb. 19. Following the dinner a theatrical and musical entertainment was given on a temporary stage. A number of manufacturers took part in the exhibit held in connection with the convention.

Proposed Licensing of Engineers in Iowa

Civil engineers in Iowa are advocating the passage of a law providing for the licensing of engineers and surveyors in that State. Civil engineering, for the purposes of the act, is held to embrace, among other things, the design and supervision of the construction of "works for the development, transmission and application of power, and of electrical, mechanical, mining, industrial, hydraulic, municipal, sanitary, structural and other works." Licenses are to be granted by a state board of examining engineers to be appointed by the Governor. Each member of this board shall be "a professional civil engineer" of recognized standing. For the first year the board may issue licenses without examination to reputable persons in responsible charge of engineering work; after that licenses shall be issued only to candidates passing an examination. Penalties are provided for the punishment of persons claiming to be licensed engineers without legal authority.

President Eliot on the Expert Witness

In his address on "The Causes of Dissatisfaction with the Courts," delivered before the Massachusetts Bar Association, Dr. Charles W. Eliot, president emeritus of Harvard University, named several of the abuses of legal practice in this country, mentioning among the number the introduction of the expert witness whose testimony is relied upon to prove the case of the side on whose behalf he appears. President Eliot said:

"With the enormous extension of applied science into commerce, trade, manufacturing and transportation a new kind of advocate has found a place in the courts, namely, the expert witness; and from the frequent employment of such experts in both civil and criminal cases a new source of popular distrust and disaffection has appeared in the courts. Many suits involving large amounts of money turn on expert testimony, and the experts summoned on either side turn out to be not witnesses but advocates.

"In two classes of cases these hot disputes between men of science, enlisted on opposite sides of the same case, have brought great discredit on judicial procedure and on men of science as candid students of the truth. These two classes of cases are patent cases and criminal cases involving testimony about insanity. Remedies have been suggested but not adopted. The employment by the court of official experts is the most promising of these remedies. Another proposal is a limitation of the number of experts that shall be called in a given case.

"A better remedy might perhaps be found in a reformed public sentiment concerning expert testimony within the professions of the engineer, chemist, physicist and physician or surgeon. It ought to be a disgrace to members of any of these professions to appear in court, for money, to set forth so much of the truth as tells in favor of one side of the case, while suppressing all parts of the truth which support the contention of the other side.

"In other words, it ought to be made clear in all those professions that honor requires their members to appear in court only as impartial expositors of scientific truth so far as it is ascertained."

Franchise Adjustment at Fort Collins, Col.

The City Council of Fort Collins, Col., has now contracted for its supply of electrical energy with the Northern Colorado Power Company, of which Mr. H. N. Wallace is manager. The company agrees to relinquish all claims it may have or purport to have to a franchise upon the streets of the city, although the city in turn confers upon the company the use of the streets and alleys for a period of ten years, upon the expiration of which time the city shall have the option of purchasing the distribution system at its "going value." Meanwhile the company is to continue in use of the streets until the city shall have decided to exercise such option. A net rate of 8.5 cents per kw-hr. is established by the contract, which provides that magnetite-arc lamps are to be substituted for the present carbon-arc lamps. Mr. R. McF. Doble represented the city as consulting engineer. This contract ends a two-years' conflict which for a time tended toward the construction of a municipal lighting plant.

The Technical Staff in Public-Utility Regulation

In a paper read before the Indiana Sanitary and Water Supply Association at Indianapolis, Feb. 26, Prof. W. D. Pence, chief engineer for the Wisconsin Railroad Commission and professor of railway engineering at the University of Wisconsin, described the functions of the joint technical staff of the Wisconsin railroad and tax commissions in the regulation of the public utilities of the State. The situation in Wisconsin is to be regarded with special interest on account of the thorough-going scheme of regulation there provided for in the initial legislative enactment and the broad powers that have been exercised in a vigorous way by the regulating commission.

The organization scheme of the Wisconsin commission's engineering corps includes its division into the following staffs: administrative, office, civil engineering, mechanical engineering, electrical engineering, gas engineering, gas and electric service, telephone service, railway service and miscellaneous.

The administrative staff consists of the chief engineer, assistant chief engineer and the heads of departments responsible for the direction of the work. The mechanical engineering staff is engaged in the inspection and valuation of mechanical details of the physical property of utilities, including such items as power-plant machinery and equipment, steam and hot-water plants (except street mains), machinery and tools, etc.

The electrical-engineering staff inspects and appraises electrical machinery and appliances in power plants and elsewhere, electric-railway rolling stock, electrical distribution systems, overhead and underground, telephone plants and various tools, stores and supplies related to the above items. It also makes investigations with the aid of other departments and of plant operators with a view to suggesting improvements in the operating conditions of electrical properties.

The gas and electric service staff inspects and investigates gas and electric service, formulates and revises rules for standards of service, tests and calibrates instruments used in service measurements, investigates electrolysis of mains, and suggests improvements.

The technical staff is made up almost exclusively of technical graduates who are appointed in part through a formal rule of the State Civil Service Commission and in part by special authorization by the Railroad Commission. In the recruiting of the engineering staff there is entire freedom from political influence or pressure of any description.

The commission has established uniform systems of accounting for the various utilities of the states and in accordance therewith has formulated a classification scheme for grouping the various items of physical property. For electric utilities these are as follows: A—land: (1) power-station land, (2) substation land, (3) all other lands; B—transmission and distribution: (1) transmission system, (2) distribution system, (3) transformers, (4) meters, (5) commercial lamps and lamp equipment, (6) municipal-contract lighting systems; C—buildings and miscellaneous structures: (1) power-plant buildings, (2) substation, transformer-station and storage-battery buildings, (3) general office buildings, (4) miscellaneous buildings; D—plant equipment: (1) steam-power-plant equipment, (2) gas-power-plant equipment, (3) hydraulic-power-plant equipment, (4) boiler-plant equipment, (5) producer-gas equipment, (6) dams, canals and flumes, (7) substation, transformer-station and storage-battery equipment; E—general equipment: (1) utility equipment, (2) general office equipment, (3) shop equipment, (4) miscellaneous equipment; F—paving: paving over trenching; H—materials and supplies: (1) electric-line supplies, (2) power-plant supplies, (3) general office supplies, (4) fuel, (5) miscellaneous supplies.

For gathering information concerning the quality of the utility service rendered in the State, traveling laboratory equipments have been provided, service investigations being made as follows: (1) Accuracy of meters; methods of testing; limit of error allowable. (2) Uniformity of voltage; allowable variation from normal; interruptions. (3) Lamp efficiency; provisions for lamp renewals; voltage. (4) Installation; safety; voltage limits; adequacy of wiring.

"It was early seen," said Professor Pence, "that to adopt the drastic basis of enforcement would require a large outlay in the way of field staff and laboratory equipment, and the decision was made to adhere to the policy of moderation which had pervaded the previous work of the commission. It was also seen that undue pressure at the outset would discourage and possibly even disable certain of the smaller and weaker utilities which ought to have reasonable time and assistance in adjusting themselves to the change of situation brought about by the enactment of the utility law. Besides, the opportunity to stimulate, on the part of the utilities, the habit of self-criticism on a sound and scientific basis and to cultivate the element of pride and satisfaction in the rendering of a good quality of service was not to be wantonly sacrificed. The wisdom shown in the adoption of this policy on the part of the commission has been amply confirmed by the results attained in the course of the four years and more since these rules were first adopted."

Cleveland Contractors' Methods Questioned

Assistant Prosecuting Attorney Samuel Doerfler and County Detective James Doran visited the offices of the Cleveland Electrical Contractors' Association in the Caxton Building, Cleveland, Ohio, last week and confiscated the books and records of the organization. Secretary Frank M. Grant was summoned before the grand jury and questioned as to the manner in which the members conduct their business. An attempt was made to show that the contractors maintain a certain fixed price. Mr. Doerfler declares that the data and sales books by which the contractors are said to be guided were secured among the other property taken from the offices.

Recently a raid was made on the offices of the Cleveland Insurance Exchange, its books and records were taken and its secretary and clerical force were called before the grand jury. In this case indictments were returned against a number of prominent agents on the charge of violating the anti-trust law.

Arkansas Bill Defining Newspapers as Public Utilities

The bill introduced before the Arkansas State Legislature by Senator Covington to declare newspapers public utilities and to regulate the placing and heading of news concerning crimes and criminal cases passed the State Senate Feb. 27. The bill not only renders a newspaper liable for false statements by a fine of $1,000 to $5,000 but makes the reporter responsible for such items subject to a heavy fine and imprisonment. It provides that a newspaper shall give equal space and prominence to articles in refutation of misleading statements.

Application for New Franchise at Lexington, Ky.

A schedule of charges placing the maximum for residential lighting at 14 cents per kw-hr., for motor service at 10 cents per kw-hr. and for commercial lighting at 12 cents per kw-hr., with liberal discounts, has been filed with Commissioner Charles Pulliam, of Lexington, Ky., by the Lexington Utilities Company in a petition asking that a new franchise be granted it. The Lexington Utilities Company seeks a new twenty-year franchise, for although its present permit does not expire for three years it is desirous of marketing new bond issues and desires to extend its privileges. The new schedule of charges as specified by the company is slightly lower than the original one, and it is believed that the franchise which has been asked will be given. The Housewives' League of Lexington has protested vigorously before Commissioner Pulliam against any increase in rates.

Public Service Commission News

Massachusetts Commission

The Gas and Electric Light Commission has approved the issue by the Gardner Electric Light Company of 400 shares of additional common stock at $150 per share, and of an equal amount of preferred stock at $105 per share, to meet the cost of extensions and improvements. The company recently built a high-tension line from Gardner to Barre at an expense of about $52,000, constructed distribution systems in the towns of Westminster, Hubbardston and Barre costing $35,000, and made additions to its generating station and distribution system in Gardner costing $37,000. The excess of these expenditures over the proceeds of stock previously approved is about $102,000.

Chairman Barber of the Gas and Electric Light Commission recently appeared before the legislative committee on ways and means in support of the resolve to appropriate $15,000 to enable the Attorney-General to meet the proceedings in the Haverhill gas case, as outlined recently in these columns. An injunction has been obtained by the gas company in the federal courts against the enforcement of an order of the board reducing the price of gas. Chairman Barber has declared that the future of public-utility regulation in Massachusetts is at issue in the case.

New York Commission

The New York Public Service Commission of the Second District has authorized the Chatham Electric Light & Power Company to exercise franchises for furnishing service in Ghent, Claverack and Philmont, Columbia County. The application was supported by the Philmont trustees. The application of the Philmont Lighting Company for approval of franchises previously granted by the village of Philmont and town of Claverack was denied.

Maryland Commission

In an order signed Feb. 25 by the Maryland Public Service Commission the Consolidated Gas, Electric Light & Power Company of Baltimore was authorized to sell $312,000 of 4.5 per cent bonds dated April 1, 1904, part of an issue of $15,000,000.

Ohio Commission

The Ohio Public Service Commission has granted permission to Mr. T. J. Smith, sole owner, to sell to the American Gas & Electric Company all assets, franchises and property belonging to the New Lexington (Ohio) electric-light plant.

California Commission

The Railroad Commission has rendered a decision denying without prejudice the application of the Arrowhead Reservoir & Power Company to issue $4,000,000 of bonds. Suits were pending against the company in the Superior Court of San Bernardino County and in the United States Circuit Court at Los Angeles, and the commission held that it would be improper to authorize the issue of bonds.

A decision has been rendered granting the application of the San Diego Consolidated Gas & Electric Company to issue $204,000 of bonds. The San Diego company was also granted authority to exchange lands with the Park-Grable Investment Company in La Mesa, San Diego County.

The City Electric Company of San Francisco has applied to the commission for authority to sell $833,000 of bonds which it had been previously authorized to pledge as collateral security.

Wisconsin Commission

Upon complaint that the electric rates in Columbus, Wis., were discriminatory and unsatisfactory, the commission has ordered the present schedule discontinued and the following rates put into effect: Primary rate, 10 cents net for the first thirty hours' use per month of the active connected load; secondary rate, 8 cents net for the next sixty hours' use; excess rate, 6 cents net. In class A, consisting of residences, the active load is to be 60 per cent of the connected load up to 500 watts and 33⅓ per cent of the connected load in excess of 500 watts. In class B, consisting of stores, offices, etc., 70 per cent of the total connected load is to be active. In class C, consisting of churches, industrial establishments, hotels, schools, etc., 55 per cent is to be active. The minimum bill is fixed at 50 cents. The rate for motor service consists of a charge of 25 cents per hp of nominal rated capacity plus an energy charge of 5 cents per kw-hr. For series tungsten street lamps a charge of $3.50 per 100-watt lamp per year and an energy rate of 4.5 cents per kw-hr. was considered reasonable.

Missouri Commission

The Missouri State Senate has passed the public-service commission bill by a vote of 26 to 5. The bill provides for the regulation and control of all utilities in the State and from the Senate will go to the Governor for his signature.

Current News and Notes

ARGENTINE "WIRELESS" SIGNALS REPORTED AT NEWPORT.—Operators at the naval wireless-telegraph station at Newport, R. I., on March 4, reported catching messages which, it is supposed, were being exchanged between two stations in the Argentine Republic, 7000 to 8000 miles distant. If these signals were correctly identified, this may be the greatest transmission distance yet reached with "wireless."

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LEGAL STATUS OF THE ENGINEER.—At a meeting of the Western Society of Engineers in Chicago on March 3 there was a topical discussion on the "Legal Status of the Engineer." Messrs. W. H. Finley, Lyman E. Cooley, B. J. Arnold, John W. Alvord, W. C. Armstrong and others took part. Relative to a licensing law in Illinois it was said that the licensing of structural engineers will follow naturally after the enactment of a state building code. Other engineers in Illinois do not appear to think a licensing law necessary.

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LARGE HYDROELECTRIC PLANT IN SWITZERLAND.—The Löntsch Power Works, on the Klönthalersee, near Glaurus, Switzerland, are making arrangements for the installation at their power station of a 15,000-hp turbo-generator set which is being built by the Theodor Bell & Company, of Kriens, and Brown, Boveri & Company, of Baden. The present equipment consists of six 6500-hp turbines directly connected to their respective generators. With the additional unit the plant will have an aggregate rating of 54,000 hp, making it the largest power plant in Switzerland.

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ELECTRIC PLANT PUTS TO SEA.—According to reports, the electric-light plant which has supplied the town of Ocos, Guatemala, for the last four years is about to weigh anchor and put out to sea. Four years ago a steamer of the Kosmos line, while making a voyage to San Francisco from European ports, was carried into shoal water near Ocos by a tidal wave, but rested on an even keel with undamaged machinery. An enterprising Guatemalan is said to have run wires from the ship to the shore and made effective use of the ship's generating plant to supply the local community. A Philadelphia salvage company has succeeded in refloating the ship, however, and oil lamps will probably come into fashion again in Ocos.

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INSTRUCTION IN SAFETY.—The Brooklyn Rapid Transit Company has entered into an arrangement with the American Museum of Safety for a six months' campaign in the public schools of Brooklyn on the subject of safety in the streets of the borough. The Museum has been working along similar lines in the Borough of Manhattan for some time and has in this matter the hearty co-operation of the Board of Education. It is hoped that through the school children the instruction will reach all those who use the streets as pedestrians, travelers on the surface cars or drivers of vehicles. The president of the Museum is Mr. Arthur Williams, and the director under whose supervision this campaign will be conducted is Dr. W. H. Tolman.

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UNIVERSITY OF CALIFORNIA SCHOLARSHIPS.—Among the fellowships and scholarships established by the University of California for the academic year 1913-1914, there are two Flood fellowships in economics, yielding $600 each; one or two fellowships in physics under the Whiting fund, yielding $600 each; one James M. Goewey scholarship in natural science, yielding $250, and one research fellowship in problems of city growth (established by the Order of the Native Sons of the Golden West), yielding $1,000. These fellowships and scholarships are open to graduates of other colleges and universities as well as to those of the University of California. Applications for the research fellowship must be filed by March 15, and for the others by March 20 and sent to the recorder of the faculties, University of California, Berkeley, Cal.

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ELECTRICAL INSTRUMENTS IN ENGLAND.—Special Agents' Series No. 55, just issued by the Department of Commerce and Labor, Bureau of Manufactures, Washington, D. C., is a report by Mr. H. B. Brooks, commercial agent of the Department of Commerce and Labor, dealing with the manufacture of electrical instruments in England. The equipment, number of employees and hours of labor, and more particularly the nature of the products manufactured by seven leading makers of electrical instruments in England, and a number of consular reports relating to the use of electrical switches, make up the contents of this thirty-eight-page report.

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COLORADO ELECTRIC CLUB'S PLAN FOR EDISON STATUE.—In connection with the electric show to be held in the city of Denver in the fall, the Colorado Electric Club is considering commissioning a sculptor of national reputation to produce a bronze statue of Mr. Thomas A. Edison, to be placed in the new civic center. Plans are under way to make the unveiling and presentation of this statue an imposing ceremony at which there will be a gathering of the leading electrical men of the industry. Mr. Edison has asked the club to refrain from carrying out the project, stating that he deeply appreciated the sentiments that actuated the Colorado Electric Club in its desire to honor him in the manner indicated, but feels that the Rocky Mountain country has already honored him sufficiently by the present expression of its good will and regard. But the end is not yet.

* * *

"WIRELESS" DETERMINATION OF LONGITUDE.—Four officers of the French army and navy have sailed for this country to assist in the experiments with the Arlington wireless-telegraph station by which it is planned to determine accurately the longitude difference between Washington and the Eiffel Tower "wireless" station. A United States army officer has also been dispatched to Paris to be present at the measurements on the Continental side. The Arlington station has already picked up messages from the Eiffel Tower, but as yet no messages have been transmitted from Washington to Paris. The scout-cruiser *Salem* is now somewhere in the North Atlantic Ocean to determine the maximum sending range of the New Arlington station. When last heard from by the ship's wireless telegraph, the *Salem* was 2000 miles distant, but it is expected that signals have been received from the powerful land station at distances much greater than the cruiser's apparatus could return an answer.

* * *

MINING IN THE MALAY STATES.—The Department of Commerce and Labor, Bureau of Manufactures, Washington, D. C., of which Mr. A. H. Baldwin is chief, has recently issued as Special Agents' Series No. 59 a twenty-eight-page report on "Mining in the Federated Malay States," by Commercial Agent D. C. Alexander, Jr., with special reference to methods and equipment and the market for American machinery and supplies. Some information with respect to the supply of energy in this little-known part of the British empire is given. The reasons for small unit installations are of interest, and one learns that, although the enormous oil fields of Sumatra, Java and Borneo are within 100 miles of these mining towns, coal at as high as $16 to $17 per ton is being used at Ipoh. Some of the best-equipped mines, however, are now driving their mills by means of producer-gas engines, all of English manufacture. They are of the suction type, with wet and dry scrubbers, and most of the engines are of the single-

cylinder four-stroke cycle design, generating from 30 to 60 brake-hp. The units are frequently installed in duplicate. In Pahang Diesel engines aggregating 245 hp are proving very satisfactory. The Chinese and Malay engineers appear to run them with little difficulty. Descriptions of the various mines are given, and the illustrations add interest to Mr. Alexander's comprehensive monograph.

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SOCIETY MEETINGS

Electricity at Panama Canal.—Mr. E. A. Lof, of the General Electric Company, presented a paper on March 1, 1913, before the American Society of Swedish Engineers on the electrical features in the construction and operation of the Panama Canal.

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Electric-Railway Problems.—Mr. Richard McCulloch, vice-president and assistant general manager United Railways of St. Louis, on the evening of March 4 presented a paper on "Electric-Railway Problems" at the meeting of the Jovian Chapter of the League of Electrical Interests of St. Louis, Mo.

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Oklahoma Association's Annual Meeting.—The second annual convention of the Gas, Electric and Street Railway Association of Oklahoma will be held on May 6, 7 and 8, at Oklahoma City, with headquarters at the Skirvin Hotel. Prof. H. V. Bozell, Norman, Okla., is secretary and treasurer of the organization.

* * *

Columbia University Electrical Society.—At a meeting of the Electrical Engineering Society of Columbia University to be held March 13, at 8:15 p. m. in the Engineering Building, One Hundred and Seventeenth Street and Broadway, New York, Mr. P. R. Goodwin, of the Western Electric Company, will lecture on "System in Manufacturing."

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Central-Station Employees to Give a Circus.—The annual entertainment given by the Commonwealth Edison Company Section of the National Electric Light Association will this year take the form of a circus. The entertainment will be held in the new Medinah Temple on the North Side, the date being Saturday, May 10. Some unusual "stunts" are promised.

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Cleveland Section, A. I. E. E.—At the recent meeting of the Cleveland Section of the American Institute of Electrical Engineers, Prof. George Goldman, of the department of electrical engineering, Syracuse University, gave an address on the subject of "Transformers for Multi-Frequency Operation." Mr. G. A. Thornton also spoke on the subject of "The Constant-Current Transformer."

* * *

Canadian Convention, June 23, 24 and 25.—The Canadian Electric Association will hold its next annual convention at the twin cities of Port Arthur and Fort William June 23, 24 and 25. Favorable transportation arrangements have been made, and a big convention is anticipated. Mr. W. L. Bird, of Fort William, general superintendent and secretary of the Kaministiqua Power Company, is president of the association.

* * *

N. E. L. A. Company Section in St. Louis.—The monthly meeting of the Union Electric Light & Power Company Section of the National Electric Light Association was held in the company's assembly hall in St. Louis on Feb. 28. Mr. H. W. Eales, assistant superintendent of distribution and assistant chief electrical engineer, gave a talk on "Adaptability of Electrical Machinery to Industrial Loads," illustrated by lantern-slide pictures. There was a good attendance and the Union Electric Orchestra and the Glee Club furnished music.

Michigan Convention, Ottawa Beach, Aug. 19-21.—The 1913 convention of the Michigan Section of the National Electric Light Association will be held at the Ottawa Beach Hotel, Ottawa Beach, Mich., Aug. 19, 20 and 21. The former plan of holding the Michigan meetings on board ship during lake cruises has been given up this year, since it was found that many central-station men were kept away on account of the resulting four or five days' enforced absence from their business. Ottawa Beach is located on the eastern shore of Lake Michigan and affords excellent facilities for boating, fishing, bathing, playing golf, horseback riding, etc. Mr. Herbert Silvester, 18 Washington Boulevard, Detroit, Mich., is secretary of the Michigan Section.

* * *

March Program of the St. Louis Jovians.—The League of Electrical Interests, Jovian Chapter, has arranged an interesting program for the remainder of this month, including a paper by Mr. George McD. Johns, superintendent of the Fire Alarm Telegraph System of St. Louis, on "New Developments in Fire Alarm Telegraph Systems," which will be given March 11. The following week Mr. Fred Adam, vice-president and general manager of the Frank Adam Electric Company, will speak on "The Relation of the Electrical Interests to the Architect," on which occasion the architects of St. Louis will be the guests of the league. "The Use of Electricity in the Largest Office Building in the World" will be the subject of a paper by Mr. H. H. Humphrey, consulting engineer, on the evening of March 25. Mr. Claude L. Matthews, of W. N. Matthews & Brother, St. Louis, is chairman of the entertainment committee of the League of Electrical Interests.

* * *

Kilowatt Club of Brooklyn Edison Company.—The regular monthly meeting of the Kilowatt Club, whose membership includes employees of the Edison Electric Illuminating Company, of Brooklyn, and electrical contractors in that city, was held on the evening of Feb. 24. Mr. S. D. Sprong, electrical engineer of the local company, spoke on "The Brooklyn Edison System in Its Relation to the Electrical Contractor." In the course of his remarks he spoke of the policy of American public utility companies of giving free renewal of incandescent lamps to certain of their customers, stating that this is contrary to European practice. Last year, he said, the cost to the Brooklyn company for free lamp renewals was $112,000. This amount, he considered, was well spent, since by giving to its customers lamps which it knew were efficient the company promoted standardization of its lighting service and gave assurance to the customer that he was obtaining the most economical medium through which to use that service.

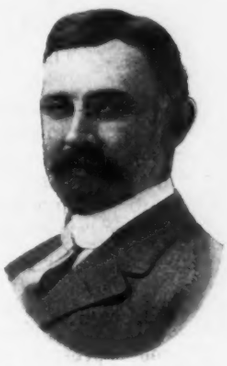
* * *

National Fire Protection Association.—The electrical committee of the National Fire Protection Association, whose annual meeting is to be held this month, as mentioned in our issue of Nov. 23, 1912, page 1088, has arranged for the meeting on March 26 and 27, at 10 a. m., at the rooms of the New York Board of Fire Underwriters, 123 William Street. A recently issued *Bulletin* refers to matters that were brought to the attention of the electrical committee at the last meeting which were deemed of sufficient importance for further discussion before action was taken. The reports of the sub-committees which have been active during the past year will be considered by the full committee and brought before the New York meeting for final action. The *Bulletin* contains general suggestions for changes in the National Electrical Code made by the committee on the New York Code, giving also reports of other committees and suggested changes in rules. Mr. Ralph Sweetland, 141 Milk Street, Boston, Mass., is secretary of the electrical committee.

Conference of Electrical Development Society

A far-reaching and significant movement marked by two-day inaugural sessions of the society for promoting commercial expansion—All branches of the industry enlisted and represented

For the fertility of practical ideas which it produced, for the unmistakable evidences that were shown of the keen desire on the part of all who attended to give and to receive constructive suggestions and criticisms for the common good, and for the broad-minded attitude in which many of the ever-present problems of the electrical field were discussed, neither with bitterness nor with harshness, but in a spirit of real co-operation, the conference which the Society for Electrical Development, Inc., held in the United Engineering Societies Building, New York, on March 4 and 5 may be regarded as marking a new era of progress in the history of the electrical industry.



HENRY L. DOHERTY

This conference was the first tangible result presented to the electrical industry at large of the vast amount of detail work that has been performed by the committee which was appointed by representatives of the central stations, manufacturers, jobbers, contractors and dealers at the meeting held by these interests at Association Island, New York, on Sept. 3, 1912, to create an organization to carry on a co-operative electrical movement throughout the whole of the United States.

The progress of the organization committee—the names of whose members appeared in the *Electrical World* Sept. 7, 1912—leading to the incorporation of the Society for Electrical Development, Inc., has been recounted in these columns and the plans and purposes of the society have also been given.

JAMES M. WAKEMAN

The personnel of the society's officers and executive committee, whose names were given in the *Electrical World* Jan. 18, 1913, is composed of men of long and successful experience in all branches of the electrical industry. Representative as these men are of the highest thought in the field, their affiliation with the society and the indorsement given to it by the interests which they represent furnish assurance that in so far as is within the possibilities of human endeavor, the society will become a potent force for the mutual benefit of those engaged in the manufacture, sale or utilization of electrical energy or appliances and for the greater uplift of mankind.

About 175 were present when President Henry L. Doherty called the conference to order at 10 a. m. on March 4.

After making an opening address, Mr. Doherty presented Mr. James M. Wakeman, general manager of the society, who spoke on the "Aims of the Society." He was followed by Mr. Frank H. Gale, of the General Electric Company, who read a paper on "The News Value of Electricity."

After a long and animated discussion of Mr. Gale's paper, an adjournment was taken until 2:30 p. m. At the beginning of the afternoon session, Mr. Doherty introduced Mr. Philip S. Dodd, secretary of the Society for Electrical Development, Inc., who gave a brief outline of the program that had been prepared for the session.

A paper on "Electricity and the Architect," by Mr. Frank E. Wallis, of Wallis & Goodwillie, architects, New York, was then read and discussed.

Dr. Talcott Williams, director of the School of Journalism, Columbia University, followed Mr. Wallis with an eloquent address on "The Dissemination of News," in which he gave an exposition of the excellent work that is being done at the school and told of some of the ways in which this work would ultimately be of benefit to the electrical industry.

Mr. T. Commerford Martin, executive secretary of the National Electric Light Association, then told where that association and the Society for Electrical Development, Inc., have a common interest.

The next paper was by Mr. J. C. McQuiston, of the Westinghouse Electric & Manufacturing Company, whose subject was "Efficiency in Local Advertising." This paper induced a vast amount of useful discussion and, owing to the lateness of the hour, further business was postponed until the evening session, which was started at 8.00 p. m.

At this session interest was aroused to a high pitch by the reading by Mr. T. Commerford Martin of a digest which had been made by him of the many ideas and suggestions for carrying on the society's work that had been received by mail from individuals, electrical associations, luncheon clubs and other sources in the various large cities and elsewhere. This brought out an abundance of discussion, some of which had to be reserved for the opening session on the morning of March 5.

Upon completion of this discussion, a paper by Mr. J. Robert Crouse, the pioneer in the movement for co-operation in the electrical field, was read and discussed.

This was followed by a paper on "The Sales End" by Mr. James H. Collins, whose articles on commercial topics in the *Saturday Evening Post* have attracted much favorable attention.

The morning session on March 5 was brought to a close by the reading of a paper on "Merchandising Co-operation" by Mr. W. E. Robertson, of the Robertson-Cataract Company, Buffalo, N. Y. This paper served to reopen the long-standing controversy between the central-station companies and the contractors and dealers on the question of the course to be followed by each in the sale of appliances.

Although this discussion was taken up with vigor by the representatives of both of these branches of the industry, the entire debate was carried on without bitterness and all who participated signified their willingness to act harmoniously in arriving at the solution of this complex problem.

After the reading of Mr. Robertson's paper, adjournment was taken until 2 p.m. Many of those at the con-

ference accepted the invitation of the Luncheon Club of the Jovian Order in New York to attend its semi-monthly luncheon held on March 5, and when the conference was resumed a large number of the Jovians were in attendance.

Upon completion of the discussion, in which the speakers were limited to five-minute speeches, Mr. William D. McJunkin, of Chicago, read a paper on "An Electrical Advertising Campaign," in which he suggested with great detail, a plan for an advertising campaign which the society might adopt to accomplish its purposes.

After this paper, a number of moving pictures portraying uses of electricity were given through the courtesy of Mr. J. C. McQuiston, of the Westinghouse Electric & Manufacturing Company.

The conference was then adjourned until 7 p. m., when a banquet was held at Delmonico's.

On March 6 the executive committee of the society took under consideration all of the ideas and suggestions that had been produced at the conference, with a view to determining which of these could be used efficaciously by it in its work.

OPENING SESSION, MARCH 4

Mr. Henry L. Doherty gave the opening address, but before going into the chief features of it, made a few remarks to explain the reasons for holding the conference. First, he said, the organizers of the society had been anxious to get the movement actually under way as soon as possible and, secondly, it had been thought that a much broader line of ideas would be developed at a meeting open to the entire electrical fraternity than would have been the case had the society simply presented its own plans. Had the latter method been followed, the industry at large would probably have given more attention to merely improving the details of the society's plans than to developing valuable ideas for carrying on the work.

He stated that while no active steps have yet been taken to solicit funds, voluntary subscriptions to the amount of over $100,000 have already been received. The society wants to raise a fund of $200,000 as a minimum for carrying on its work.

He mentioned the four groups of electrical interests represented in it—the central-station, the manufacturing, the contracting and the jobbing and dealing branches—and read the names of the twenty directors of the society, the list of which appeared in the *Electrical World*, Jan. 18, 1913, page 129. The fact that these men, and the business interests represented by them, had indorsed the Society for Electrical Development, Inc., was an indication, Mr. Doherty said, of the extent to which interest has already been taken in it.

"Electricity is in its infancy" is a bromide, he continued. What this expression really means, he said, is that as far as being a science is concerned, it is one of the best developed of the industries, but when considered from the standpoint of commercial application, it is exceedingly young. In other words, he pointed out, the commercial application of electricity lags far behind the technical or scientific side of the art. The work of the society is to bring about a general, harmonious movement to stimulate the commercial application of electricity.

He asked each man present to view the conference from the standpoint of what he would do if he had given to him a fund of $200,000 to be used for developing the application of electricity to best advantage.

The Opening Address

After these explanatory remarks, Mr. Doherty asked Mr. A. W. Burchard, of the General Electric Company, to preside, and then gave his opening address. In it he first stated that there is a strong sentiment at this time in this country against "big business" or large aggregations of capital and expressed some doubts as to the future of prosperity in this country if this present attitude toward these questions on the part of the government is continued.

He contrasted conditions in this country with those in Germany, saying that prosperity prevails in that country since its head is a man of great business acumen. Over there, he said, they have realized the advantages of stimulating and encouraging the business man, as is shown by the decrease in the rate of emigration from Germany. Oftentimes, he observed, a man was knighted over there for meritorious services in a business way, while in this country a man is indicted for similar services.

What the society wants to do, Mr. Doherty continued, is to bring about a consolidation that will be beneficial to everyone and objectionable to none.

The first point which the speaker wanted to emphasize, he said, was that the progress of civilization can be roughly measured by the extent to which electricity has been substituted for manual labor. In so far as it can work toward increasing the uses of electricity, the society will be helping to establish a higher plane of civilization.

The work before the society amounts to more than a national advertising campaign, Mr. Doherty stated. Such an advertising plan, however, had his hearty approval and he felt that none present could doubt its value. Statistics showed, he said, that the electrical consumption of all kinds in this country, per capita, is $30 per year. Many successful national campaigns are being carried on to advertise products with a far less per capita consumption than this, so that it would certainly be profitable to advertise the electrical industry on a national scale.

Mr. Doherty said that he expected that the amount of free publicity which the society would receive in the daily press would be enormous, since its affairs would be of real news value.

Examples of Good Work Which the Society Can Do.

To indicate a few lines of work which the society can do, Mr. Doherty said that it could accomplish much of practical value by doing what one or two central-station companies with which he is familiar have recently done. These companies have gone to the owners of some typical manufacturing plant in their territory, such as a flour mill, or a shoe factory and have induced them to equip their plants for electrical operation to the "last gasp" in return for the promise of the central-station company to give a great deal of free publicity to these plants after they have been so equipped. In this way, these companies have obtained a great deal of useful data on the cost of operating these industries electrically, which they have been able to take to other concerns in the same line and convince them of the economies and desirability of central-station service. The society, the speaker said, could do this on a large scale, extend it to all industries, have this data printed and sent to all central-station companies with the result that complete data could be presented to prospective customers in any line of industry and large gains made in the business of the central-station company.

Electricity on the Farm

With the wide use of the motor car, there has come a large use of country roads, Mr. Doherty continued. If these roads were lighted by electricity many benefits would result. Not only would this lighting be a source of revenue to the central-station companies, but it would help to stimulate the use of electricity for farming operations, and incidentally to reduce the cost of farm products and hence the cost of living.

Electricity in the Automobile Field

Electrical men little realize, Mr. Doherty went on, the opportunity that awaits them in the many uses to which electricity can be utilized in the gasoline car. Within the

next two years an automobile without an electric self-starter will be unsalable, he said. With this small electric power plant for a beginning, there are at least thirty additional uses for electrical energy in a gasoline motor car, the speaker said, which a well-known automobile manufacturer had recently told him were as yet unthought of by electrical men. This automobile company has been induced to undertake experiments for developing the use of electricity in every possible way on a gasoline car. Examples of this kind, Mr. Doherty said, should indicate to the electrical industry something of the aims of the society and should justify people in taking an interest in it. Federal bureaus of all kinds and state and civic boards and bodies will be asked to give their co-operation to the movement, all of which will help to encourage universal thought on electrical matters. In conclusion, he expressed the willingness of the society to receive suggestions from any source so as to insure the highest possible efficiency in its work.

Discussion

Mr. A. W. Burchard said that the proposed work is unique and that he knew of nothing in the history of civilization corresponding with it. He considered it fortunate that this work should have been undertaken by the youngest of the great industries. It is very easy, he said, to enunciate general principles; in the society's work progress must be made through specific suggestions and by united effort along parallel lines by the four groups into which the industry has been divided by the society.

AIMS OF THE SOCIETY

Mr. Doherty then resumed the chair and introduced Mr. James M. Wakeman, general manager of the society, who spoke on the "Aims of the Society." Up to the last minute, he said, it had been hoped to have Mr. Thomas A. Edison at the conference, but this had been found impossible owing to pressure of business. He read a letter, however, from Mr. Edison expressing the latter's regret and wishing every success to the society.

The latter, Mr. Wakeman observed, was the result of thought, money, time and effort on the part of hard-headed business men and hopes to be a potent factor for increasing the demand for electrical energy, supplies and apparatus. He pointed out that a great deal more can be accomplished by joining forces than by individual effort. Co-operative, constructive work is now needed, he felt, in the commercial side of the electrical industry, which has reached a stage of successful production.

SOME METHODS FOR SECURING PUBLICITY

Publicity of a kind that will induce the public to realize the advantages and economies of electrical energy is what is needed, he thought. Some of the methods he suggested for securing this were: advertising on a large scale in magazines and newspapers and having articles of electrical news value written by well-known men whose names will insure that these articles shall be read; supplying the daily press with electrical news; exhibiting moving pictures of electrical interest; having the technical press analyze the business practices of successful electrical manufacturing concerns, contractors and supply dealers; educating farmers, architects and others in the great merits of electrical service.

For the last purpose a traveling force could be maintained by the society, while a corps of trained solicitors could also be maintained and placed at the service of small companies, at a small charge, for special campaigns.

In conclusion, Mr. Wakeman stated that the society had received the indorsement of many of the national electrical associations, manufacturers and the technical press, and that its far-reaching connections can make it the greatest "booster" ever known.

THE NEWS VALUE OF ELECTRICITY

Mr. Frank H. Gale, of the General Electric Company, then read a paper on "The News Value of Electricity," in which he said that news should be written and treated from the standpoint of the reading public, not from that of the advertising writer. Only items of real, legitimate news value, of interest and benefit to the public, should be furnished to newspapers.

There is a vast amount of news value, he said, in all branches of the electrical industry. There is something new happening every day of interest electrically, so that there is an almost unlimited field for good material open for use in newspaper publicity campaigns.

Of this material, part of it, that of a technical nature, does not appeal to the general public, but is useful to the technical press. On the other hand, there is always much in which the general public would take an interest. Real news and press-agent matter must be kept entirely separate.

Public-service corporations have long since found out that frankness and publicity pay, said Mr. Gale. Where officers of such companies have been close-mouthed and loath to talk to representatives of the local press, the reporters have often turned in unfavorable items pertaining to the central-station companies for lack of other news. Central-station managers should keep in touch with the newspaper men in their territory and encourage them to visit their offices.

The fiction of the day, Mr. Gale said, now contains many electrical references. He looks, he said, for an increase in the use of electrical terms in current literature.

Old-fashioned reading notices are no longer acceptable by trade or class journals, the speaker continued, but there is always a place for a good electrical article. All publicity work should be conducted fairly and the article tested for real news value, and no subterfuge of any kind attempted.

AN ELECTRICITY WEEK

He suggested that an "electricity week" be inaugurated, to occur simultaneously all over the country. Local dealers and central-station companies could make special offers at this time. The occasion, Mr. Gale felt, would become one of local interest which editors could not ignore and would greatly stimulate the use of electricity and publicity in the daily press. Electricity fulfils every requirement from a news standpoint, he said, which of itself is an indication of the youth of the industry, so that the present is a most opportune time to benefit by proper publicity methods and to put these into effect.

Discussion

Mr. W. E. Robertson, vice-president of the Robertson-Cataract Company, Buffalo, N. Y., and vice-president of the society, then replaced Mr. Doherty in the chair, so that the latter might participate in the discussion of Mr. Gale's paper.

Mr. Doherty stated that nowadays newspapers realize that press-agent work has been greatly overdone and the newspaper tendency is to reject business items. He thought that the newspapers should point out to business men where they should draw the line. He felt that there are hundreds of untold items concerning the electrical industry that are far better than those appearing in the daily press.

Mr. Wakeman mentioned as an indication that newspapers would accept an item of a business nature if of real news value the fact that the announcement of the conference, a business item, had appeared in over 300 newspapers.

Mr. C. G. Durfee, of the Rochester (N. Y.) Railway & Light Company, said that it is not difficult to get newspapers to publish items if approached in the proper way. In explanation, he told how difficult it had been in Roch-

ester a few years ago to get any electrical news in the local papers, and how after Mr. R. M. Searle, vice-president of the company, had told each employee that he might say anything whatsoever to reporters concerning the company's affairs, provided he always told the truth, conditions had been vastly improved.

In this way every person in the organization had been made an intermediary between the company and the local press, and the only restraint placed on any man was the proviso that he should always tell the truth.

Mr. Durfee said that as a result of this policy Rochester papers have few editions in which a good legitimate piece of electrical news cannot be found, and the effect of this has been the growth of much better relations between the company and the public, and the company and the newspaper, all of which, he stated, probably was more beneficial to the company than its paid advertising in the newspapers.

All of those in the company are in accord with the reporters, and the latter visit the higher officials each day and make at least one visit per week in all the departments.

Oftentimes, Mr. Durfee said, the name of the man who gave the story to the reporter appeared in print, and some discussion had taken place at meetings of department heads as to whether this was desirable. It had been decided, he said in conclusion, that the articles would lose much of their news value if the name of the person was omitted. This added the personal, or human-interest, feature to the item, Mr. Durfee said.

Mr. L. W. Sammis, who was the next speaker, said that, speaking from twenty-five years' experience on New York papers as a reporter and editor and also an advertiser, he knew of no trouble in getting items in the daily press whenever they had real news value. Some press agents are "blacklisted," he said, and their matter rejected, but this is usually because the press agent is trying to get matter into the news column when it really belongs in the advertising or income-producing part of the paper. Editors naturally resent such practice. As long as the exploiter's name is not pushed to the front, it is not a difficult matter to get items pertaining to the use of any product into the newspapers. Mr. Wakeman's announcement had been accepted readily by the newspapers, because it was one which exploited the entire industry, not an individual or a manufacturing concern.

Be frank with the newspapers, said Mr. Sammis; see that what you send them is in a concise form with something of interest in it. The papers really want enlightenment on such matters as the use and application of electricity. Give them what they want and they'll use it.

Mr. James H. McGraw, president of the McGraw Publishing Company, paid a high tribute to Mr. Doherty, as president of the society, and stated that he should have been a newspaper man as he has newspaper logic and almost spoke the newspaper language. Mr. McGraw said that Mr. Gale's paper was an excellent one and had interested him greatly. News items written along the line suggested by Mr. Gale would be real news and would be welcomed as such by the papers. There is no mystery of any kind concerning publicity work, the speaker continued; it is a straightforward, definite matter nowadays. The man who does not give intelligent thought to the subject is the one who does not understand the language in which publicity items should be treated, he said. What had been done in Rochester—convincing the newspapers that the public-service company there was telling the truth to them at all times—can be done everywhere, in every town and city, and if that policy is followed, the industry need have no fear of the daily press.

What the Public Wants

Mr. Z. W. Carter, Boston, stated that the thought to be kept in mind is, "What does the public want in the way of electrical news in the daily press?" He believes that business men are greatly interested at all times in electricity and in his experience has always found them keenly interested in visiting electrically operated factories. The editor of a Boston paper told him recently, he said, that he was greatly interested in electricity and wanted to hear more of it, which indicated that there is no trouble in giving away legitimate news. There is a great deal of such news, Mr. Carter said, which is not published because not given to the papers.

Mr. D. T. Pierce, of the McGraw Publishing Company, stated that in many years of experience as a newspaper man he had found that corporation heads often lost sight of the vast amount of benefit which their corporations could receive from proper publicity work at the right time. One of the best things the society can do, he thought, is to educate central-station managers to act effectively and intelligently in obtaining publicity in their local matters. Although the matter might often be prepared by a central bureau, it would be more efficacious if sent to local men so that they could hand it to the local papers. He emphasized this by telling of a railroad company which had followed this method, sending information to its station agents from its publicity office and letting the agents give local reporters the news items. This method had made the station agents a factor in the local news. The idea is capable of great extension, Mr. Pierce thought. He told something of the vast amount of matter that comes into a daily newspaper office and is rejected. For this reason care must be taken to get something of special interest in a news story in order to make it acceptable.

Mr. Earle Whitehorne, of *Selling Electricity*, said that he had found Mr. Durfee's remarks of great interest. He said that there is an army of special writers who stand ready to co-operate with the society, should the latter take up the idea of creating a central news bureau.

It being 1 p. m., adjournment was taken.

AFTERNOON SESSION

When the meeting reconvened at 2.30 p. m. President Doherty read a telegram from Mr. Charles F. Brush, the pioneer inventor in electric-arc lighting, who expressed his sympathy with the movement and his best wishes for the success which he prophesied was certain, owing to the high ideals of the society.

Mr. Doherty then introduced Mr. Philip S. Dodd, secretary of the Society for Electrical Development, Inc., who, Mr. Doherty said, was the second pioneer in the co-operative electrical movement, Mr. J. Robert Crouse being the first.

Mr. Dodd gave a short résumé of the program that had been prepared for the afternoon session.

Electricity and the Architect

Mr. W. H. Johnson, of Philadelphia, who had been asked by Mr. Doherty to take the chair, then introduced Mr. Frank E. Wallis, of Wallis & Goodwillie, architects, New York, who read a paper on "Electricity and the Architect." This paper was written in a happy vein and contained many valuable suggestions for improving relations between architects and electrical men. Light, said Mr. Wallis, is the fundamental feature of architecture and for that reason the architect and the electrical man have much in common. The use and misuse of electric light must always be taken into consideration by architects. Electrical men, he asserted, can get on much more favorable terms with the architect if they understand the architect's reasons for doing things; that is, his reasons for making changes in electrical installations for the purpose of softening and accentuating the design features of a room or building, etc.

Architect Needs Aid of Electrical Men

He preferred to consider things from the attitude of the artistic and beautiful, but felt also that the financial

side should not be ignored. The architect, he said, often finds it difficult to provide an economical system for lighting, heating or wiring a building without the aid of the electrical man. Light, he continued, is the most important factor to be taken into consideration in the design of public libraries, civic centers and imposing structures of every nature, but he regretted to say that this factor is one that is greatly neglected.

He suggested that the society appoint a committee to act with the American Institute of Architects for the purpose of bringing about closer relations between the electrical man and the architect. The American Institute of Architects, he said, is doing a great public work in its own field, but co-operation with it on the part of the electrical man would result in developing much better work in both the architectural and electrical fields. Far better financial results would be obtained through the economies of design and construction that would be made possible by friendly co-operation.

LIGHT AN ENEMY TO CRIME AND DISEASE

Without heat, light and power, the speaker pointed out, we would return to barbarism. Light, and better light, are the enemies of crime and disease. In their hands, he continued, the electrical men have the power of bringing happiness to the world at large, and he urged that this tremendous power be used to the utmost advantage for all mankind. He then spoke of the work which is being done abroad by Mr. Leon Gaster in bringing about highly improved conditions in manufacturing establishments through the introduction of improved systems of illuminating. Through these systems production is being increased many times and the health of workmen is being conserved.

CO-OPERATION BETWEEN ARCHITECTS AND ELECTRICAL SALESMEN

Mr. Wallis, returning to the commercial, or what he called the "purely selfish," side spoke of the great assistance which he receives from the central-station salesmen, supply dealers and electrical contractors who call at his office to discuss business matters with him. In these men, and also in many other salesmen in other lines of business who call upon him, he finds a great fund of information which is useful to him in business.

Discussion

Mr. Doherty, in discussing Mr. Wallis' paper, said that he thought his suggestion to co-operate with the American Institute of Architects a very excellent one and one to be greatly welcomed by the society. He agreed with Mr. Wallis that the artistic side of design should be encouraged as much as possible, but said that as far as he personally was concerned his mind ran to the use of large quantities of electricity rather than to the artistic side of the art.

Mr. W. H. Johnson said that his company had employed a special man for the past four or five years to visit the architects for the purpose of getting their business, and that the relations between them and his company had been improved and that much business had resulted.

Mr. Wallis then said again, in a whimsical way, that his desire for co-operation with the Society for Electrical Development, Inc., was a purely selfish one and that it was the first time since 1876, when he started in as a practising architect, that such a society as the Society for Electrical Development had been organized, according to his knowledge. He said that he could be of great service to the members of the society in getting them in touch officially with the American Institute of Architects and would be glad to do so, that both bodies needed each other and that the architect needed the electrical man most.

Mr. Robertson said that he had been delighted with the artistic side of Mr. Wallis' paper, and that is what all are working for in the final analysis.

Mr. Dodd spoke of the great necessity that exists for co-operation between the electrical man and the architect in obtaining the best electrical equipment possible in all new buildings. Furthermore, he said, one rarely sees anything of an electrical nature in architectural magazines. He thought possibly an exchange of information between the electrical men and the architects would be of mutual service.

THE DISSEMINATION OF NEWS

Mr. Doherty then introduced Dr. Talcott Williams, director of the School of Journalism, Columbia University, New York, who was escorted to the chair by Mr. Dodd and was greeted with great applause.

Dr. Williams, after thanking the society for the hearty welcome which it had accorded him, gave an eloquent address in which he explained the work of the School of Journalism and the objects which it hopes to accomplish and told how the training which is being given to young men who are to become reporters on newspapers in all parts of the country contains an element which will be of the utmost service to the engineering industry.

There is not a calling, he said, which suffers so much with respect to the lack of knowledge of what is being done by it as that of engineering. The work of the engineer is often misrepresented in the daily press, he continued, not intentionally, but owing solely to the lack of training of the ordinary reporter. What the School of Journalism is doing among other things is to give to the students instruction upon the general principles of physics, chemistry and electrical engineering so that they will be able to express electrical and engineering matters in the proper phraseology and to appreciate the news in an engineering matter when they come in contact with it.

The whole effect of this training, he said, will be to insure more clarity and accuracy in the reporting of engineering matters for the daily press. The course which the students are given in engineering matters is not meant in any way for an engineering course, but, as stated before, is for the purpose of giving them the basic principles of the engineering industry. As a result of this work, the gap between the engineer and the American public will be more quickly bridged. Particular attention, he said, is being given in the School of Journalism to training the men in the industrial history of the country rather than its political history, the feeling being that knowledge of the history of industrial progress will be a far more valuable equipment to the present-day reporter than the usual course that is given in history.

Every effort is being made to condense courses in engineering history, etc., so that the student will get just the salient features of these and will obtain a sufficient knowledge of basic principles of all kinds so as to have a proper background for his work.

Discussion

Mr. Doherty, in discussing Dr. Williams' paper, said that there had been few speakers who had interested the society more than Dr. Williams had, and that as far as he himself was concerned he had totally failed to appreciate the work which the school is doing for the progress of American engineering and capital. He expressed himself as heartily in accord with the principle of giving to the students only the things that will be most useful to them. He felt sure, he said, that the men graduated from the School of Journalism will be centers of energy which will be helpful in developing journalism to a point which will be exceedingly useful to those present at the conference.

Mr. Max Lowenthal then proposed a rising vote of thanks to show the society's appreciation of Dr. Williams' remarks. Mr. Doherty, before putting this before the conference for action, said that he had found in Dr. Williams' work a message of great cheer to those who are disturbed by the present trend in business and engineering affairs in

this country. The work of the engineer is a good one for the community, said Mr. Doherty, but it is little appreciated by the newspapers, which tear down capitalization and destroy its beneficial results. Hence the fact that Dr. Williams is training the young men in the industrial history of the country will certainly result in their appreciating more fully the work which the engineer and the capitalist are doing and presenting their side of the case more fairly.

A rising vote of thanks was then given to Dr. Williams, who said that the appreciation given to him by those present, representative of many technical interests, carried a message of great encouragement and hope to him, for the reason that his "short-cut" methods had come in for a great deal of challenge and criticism from all sides when he first inaugurated them. He offered to the society his aid and help in any way they could be used by it and again expressed his very profound thanks for the reception that had been given to him by the society.

The Society and the National Electric Light Association

Mr. T. Commerford Martin, executive secretary of the National Electric Light Association, then read a paper in which he pointed out wherein the Society for Electrical Development and the National Electric Light Association had a common ground to work upon. The National Electric Light Association, Mr. Martin said, had indorsed the society because both of them have commercial development as their sphere. The central-station industry, Mr. Martin stated, is now doubling itself every five years, and anything that the Society for Electrical Development can do to make the industry double at a more rapid rate would be of mutual interest. Both societies, Mr. Martin went on, wanted to augment the electrical industry in every possible way and therefore had a common mission. He spoke also of the continual decrease in the cost of electrical energy to the consumer, thus helping to reduce the cost of living.

Views of the President of the National Electric Light Association

Following Mr. Martin's paper, Mr. Doherty said that Mr. Frank M. Tait, president of the National Electric Light Association, was in the room and asked him to make a few remarks.

Mr. Tait said that he had been chairman of the meeting at Association Island, New York, last summer when the committee which had organized the Society for Electrical Development had been appointed, and that while he had been a little skeptical at that time as to the success of the entire plan, because he had felt that the personal feelings of the various groups of the proposed society would outweigh any good that the society might do, his enthusiasm had been growing rapidly.

He expressed some wonderment as to just how the central-station companies were going to regard the work of the Society for Electrical Development and was somewhat surprised, he said, to see so few representatives of the central-station companies at the conference. He thought that they should have come forward in greater number and that they were losing a great deal by not being present. For their benefit he suggested that the society send a record of the meeting to each of the central-station managers.

Mr. Doherty thanked him for the promise of co-operation from the National Electric Light Association and said that he felt Mr. Tait would not be dissappointed in the outcome. He then asked if Mr. E. W. Lloyd, chairman of the Commercial Section of the National Electric Light Association, was in the room, and if so if he would not come forward and tell those present some of the work which was being done by that section.

Mr. Lloyd, however, was not in the room at the time, so Mr. Doherty went on to tell of some of the splendid work which the Commercial Section is doing. This section, Mr. Doherty said, had had a marvelous growth. He spoke of the attempts which he had made to conduct a commercial meeting of the National Electric Light Association in 1902, when he was its president, and how at that time he was unable to get enough commercial material and interest together for a three-hour session. He had then predicted that the interest in commercial progress would outweigh that in the technical and scientific sessions within five years, and he had been gratified, he said, when at the convention in Chicago in 1908 he had found the biggest hall that the association had been able to obtain crowded to overflowing at the meetings of the Commercial Section, whereas hardly anyone attended the meetings of the technical sections.

Mr. Doherty felt that co-operation between the Commercial Section and the Society for Electrical Development has great possibilities for stimulating expansion along commercial lines.

Efficiency in Local Advertising

Mr. J. C. McQuiston, of the Westinghouse Electric & Manufacturing Company, next read a paper on "Efficiency in Local Advertising." He first gave a vivid picture of electrical conditions ten years hence as seen in a dream. The luxuries of to-day, he found, were the necessities of that period. Everyone spoke of electrical equipment with the same familiarity with which one now speaks of the ordinary household devices such as faucets, etc. The streets, he said, were illuminated, not merely lighted. The homes were electric homes, and all work around the house was done electrically. Devices in shop windows were plainly marked with the name of the device, its uses, cost and the cost of operating it. Electric vehicles were in common use. Questions concerning jobbers, dealers, contractors and central-station companies were discussed in harmony and selfish feelings were submerged. He found the newspapers replete with electrical news and recipes for use with electrical devices were given in the domestic-science department of the newspapers. Moving pictures portraying all branches of the electrical industry were being shown.

All of these things are possible, said Mr. McQuiston, and all of them will eventually be. The society can help to do this, he said, in many ways. Efficiency in local advertising, he continued, can be obtained only by real co-operation. Advertising in the local paper was formerly regarded as a necessary evil, and when once a contract for advertising had been placed it seldom received attention afterward. He mentioned a case which had come to his personal attention where a central-station company had paid so little attention to its advertising copy in the local paper that in the month of June it was advertising its service for thawing frozen water pipes. The copy had been given to the paper in the winter time and the company had never bothered to change it.

When the manufacturer advertises on a broad scale the local dealer should follow this up with an advertisement in his local paper.

The People's Page

Mr. McQuiston said that he was opposed to the electrical page as it is now carried on. He said that the electrical page is ignored by thousands of people in just the same way as is the financial page, because they are indifferent to the matter on it and turn to something else from force of habit, after a mere glance at it. It generally contains, he said, many items which are of no local interest and is not prepared in an attractive form for the layman. It often quotes technical questions and answers in which the general public has no interest.

What should be done is to secure all advertising absolutely on its own merits as such. This would instil the wonders of electricity into people's minds far better than it is now done by the "people's page" in its present form. The objects of the "people's page" would be accomplished in a far better way if the items were scattered throughout the paper rather than grouped on one page as is now the case.

Manufacturers offer many aids to the dealers. They will furnish copy for local newspapers, street cars and billboard advertisements, he said, and also furnish to the dealer the service of experts on window dressing, etc.

SOURCES OF PROFITABLE ADVERTISING

Window-dressing, said Mr. McQuiston, cannot be overestimated as a source of profitable advertising. An excellent idea, he said, is to place on each appliance a tag showing the purpose, name, uses, cost and cost of operation of the appliances. Women demonstrators are also useful in stimulating the sale of electric appliances, and when such demonstrators are employed newspaper notices of their work are highly desirable.

Another way in which the local fields can be improved is by arranging for talks by well-known women on electric cooking, and talks by competent men before clubs, with lantern slides and moving pictures, on electrical subjects. Schools are a very fertile source for stimulating an interest in the application of electricity.

MOVING PICTURES AS A AID

Moving pictures, thought Mr. McQuiston, offer a very desirable form in which to stimulate the public's interest in the electrical industry. The leading film producers, he said, are now making many industrial films which show the methods of manufacturing and the use of many products. Moving pictures are presented in the evening after the day's work is done and the audiences are in the most receptive mood. An interesting scenario dealing with the generation or utilization of electricity, followed by one showing the method of manufacturing appliances for using the energy itself, would be a forcible method of showing the advantages of electricity.

BENEFITS OF CO-OPERATION WITH CITY OFFICIALS

Another good method in which to obtain efficiency in a local way is to have regular meetings between the jobbers, contractors, dealers and central-station sales agents and advertising men and to have the work that is being done along advertising lines by the central-station company explained to them. City officials should be cultivated. Oftentimes good results are obtained through the loan of apparatus to the city. The loan of pulmotors by the Commonwealth Edison Company to the city of Chicago received a great deal of publicity, Mr. McQuiston said, and helped to improve the relations between the electrical service company of that city and the latter's officials. The New York Edison Company loans fans in the summer months to hospitals and certain charitable institutions, and this, he pointed out, furnished a desirable kind of publicity. The methods of the Edison Electric Illuminating Company of Brooklyn for co-operating with contractors in the lighting and dressing of the latter's windows (*Electrical World*, Jan. 11, 1913, page 99) he also recommended highly as a means of improving local conditions.

Electric signs are an ever prevalent aid for promoting sales of appliances and electrical energy.

A TRAVELING ELECTRICAL SHOW

One thing that appealed very much to Mr. McQuiston was the economy that might be obtained from having a traveling electrical show instead of conducting the electric show along its present lines. The building of new shows is very costly and wasteful, he claimed, and the sentiment of manufacturers has become somewhat antagonistic to them. A moving electrical show, to travel all over the country, with advance advertisements of its coming, will, he thought, give fully as good results as the present expensive methods in use, at far less cost.

Discussion

Mr. W. E. Robertson, in discussing Mr. McQuiston's paper, said that he had once been the proud, but is now the unhappy, father of the electrical page. Before the electrical page was introduced dealers and contractors did not advertise, the speaker said. Only the central station and the telephone companies used advertising in the local papers. The greatest trouble with the electrical page in his opinion is that it has never been properly edited. The Society for Electrical Development might do something along the lines of editing the electrical pages in a proper manner. Everything considered, he thought possibly the best plan was to buy advertising space in the daily papers. Mr. Dodd said that the ultimate in efficient local advertising would be reached when the Society for Electrical Development was fully represented all over the country. The time would come, he thought, when all four groups of the electrical industry in the society will co-operate in local advertising campaigns.

Mr. H. B. Woodill, president of Woodill & Hulse, contractors and dealers, Los Angeles, Cal., said that what the dealers want is co-operation from the manufacturer. Mr. Woodill does not look upon the electrical page as of any service to the dealer, and he thinks that it would be a shame and a sin to publish in the State of California anything of the description of the page now published in Cleveland.

Mr. Wakeman said to Mr. Goodill that the promoting of local harmony was one of the objects of the Society of Electrical Development. Lack of harmony, he admitted, often occurred when the central-station company sold appliances at prices with which the local man could not compete. The idea of the society, he explained, is to bring these interests together so that all can make a good living in the electrical field. It would be a very good thing, he thought, if the society could get the local dealer to place his stock in the windows instead of on the shelves, and to encourage him to get a store in a prominent location instead of on the side streets.

Mr. Frederick Bissell said that the electrical page had been tried out in Toledo, but it seemed to him that it really killed more business than it brought in. A good electrical page would be welcomed in Toledo, and anyone who could work up an efficient page would be gladly received.

SUMMARY

Mr. McQuistion, summarizing, said that the great thing to keep in mind is "Are your advertisements read?" and again suggested that electrical news should be distributed throughout the newspaper so that it would be read, as it would then have a higher efficiency than if grouped on a single page, conducted in the present way.

EVENING SESSION

The session of Tuesday evening was given over to a condensed discussion of ideas and suggestions received from various individuals, electrical associations and luncheon clubs, proposing lines along which the activities of the Society for Electrical Development may best be directed. The large amount of contributed material thus received prior to the meeting was capably abstracted and reported before the society by Mr. T. Commerford Martin, executive secretary of the National Electric Light Association.

Mr. Martin read first a communication from the president of the National Electric Light Association, Mr. F. M. Tait, president and general manager of the Dayton (Ohio) Elec-

tric Light & Power Company, in which the aims and purposes of the Society for Electrical Development were strongly commended and central stations urged to join in supporting its activities.

A telegram from Mr. C. R. Huntley, president and general manager of the Buffalo General Electric Company, offered the substantial co-operation of the Buffalo General Electric Company, the Cataract Power & Conduit Company and other subsidiary Niagara Falls corporations in furthering the Development Society's campaigns.

Abstract of Suggestions Offered

Mr. Martin enumerated briefly the various heads under which he had divided the large amount of submitted material, citing such diversified classifications as general publicity, publicity within the industry, educational work, traveling shows, traveling representatives, campaigns of education for the public and for the electrical industry, books on commercial development and commercial practice, the unification of water-power laws, co-operation with civic bodies, relations with the general press, education of young men for the central-station industry, stimulation of electrical merchandising, etc.

A communication from Mr. J. C. Parker, abstracted by Mr. Martin, urged the unification of the water-power laws of the country, both state and federal. In their present condition the injustice of some of these legal enactments affects everyone in the industry, declared Mr. Parker. It is therefore to the common interest of all members of the electrical fraternity, insisted the writer, that these trammels and restrictions on the development of our national resources be reduced to their lowest limit and denomination.

Co-operation of Civic Bodies

Mr. S. L. Coles recommended closer co-operation with local chambers of commerce, boards of trade and other civic organizations. He cited an instance in which he had secured the installation of an ornamental system of street lighting in a small town, in addition to the construction of a power building for the use of small manufacturers. From both of these developments, he pointed out, the local central station will profit substantially, as well as the community.

Mr. T. C. Martin himself recommended the appointment by the Electrical Development Society of a promotion committee, whose members might be drawn from other collateral organizations in the electrical field. This committee would serve as a clearing house for the introduction and distribution of ideas. Each organization represented should also appoint its own standing committee to co-operate with the joint committee of the Electrical Development Society.

General and Technical Publicity

Dr. A. S. McAllister, senior associate editor of the *Electrical World*, pointed out the need of greater publicity concerning the objects and aims of the Society for Electrical Development. He also outlined methods by which further co-operation might be secured within the society and the industry, and urged the preparation and distribution of pamphlets showing the general public what use can be made of electricity, how to use it and what the cost will be.

A communication from Mr. O. H. Caldwell, also of the *Electrical World*, as abstracted by Mr. Martin, pointed out the value of publicity both in the general field and within the industry itself. The correspondent referred to the need of effective work to get old houses wired, and suggested the appointment of several traveling representatives to study and adjust local differences between central-station companies and contractors.

Mr. Frank B. Rae, Jr., editor of *Electrical Merchandising*, recommended that the society put a limit on its own publishing activities, avoiding the plan of any such co-operative effort which might be regarded as similar in nature to the "municipal ownership" ideas which its individual members are combating in their own fields. The quality and vigor of the present publications in the field are maintained by the principles of fair competition which now prevail. The introduction of co-operative effort, however, would be likely to drive independent publishers from the field.

Central-Station Sales Training

Mr. Sydney W. Ashe, of the General Electric Company, Harrison, N. J., pointed out that while the sum of money available for the society's use is not large, it can be applied to accomplish much effective educational work. Mr. Ashe suggested spreading the idea of central-station institutes throughout the country, similar in plan to the school already organized by Mr. Samuel Insull and his associates of the Commonwealth Edison Company, Chicago. It would be of the utmost value to the industry, he declared, to have schools of this kind for the training of candidates for central-station commercial work. Such an opportunity for preparation should attract picked young men, who should be good mixers, earnest students and well capable of taking punishment.

Electricity in Agriculture

A report from a joint committee of electrical men and Jovians of San Francisco, Cal., next read by Mr. Martin, pointed out the "A B C's" of commercial effort, which they expressed in the alliterative motto: "Attract attention; bring buyers; create confidence." This report urged the further development of electricity especially in the home and on the farm and recommended the education of both architects and farmers concerning the uses of electric lighting and motor applications. The usefulness of county fairs and other public welfare exhibitions was also mentioned among the methods for creating rural interest in electricity. Sales campaigns, it was shown, can be made more effective, for example, if they are preceded by practical articles in the farm journals supplementing and enlarging the arguments later to be presented by the salesmen. One suburban company has arranged an electric truck which has been equipped with all sorts of lighting and motor appliances. This truck can be sent out through the countryside for the local demonstration of the comforts and conveniences of electricity and central-station service.

The Boston Edison Company, added Mr. Martin, makes use of a traveling electrical exhibit, with two circus tents. One tent is put up before the first one is taken down, and in this way the exhibition material can be transferred from one location to another without possibility of injury from weather, etc. The test exhibit includes a complete display of farm apparatus adapted to be driven by electric motors, methods of illumination, etc.

Electrical Merchandising

Mr. Max Lowenthal declared that increased attention should be given to the subject of electrical merchandising, and to this end he recommended the establishment of an electrical merchandising department or clearing house by the Electrical Development Society. One way in which such a bureau might prove useful would be in the compilation and distribution of suggestions for window displays and window trimming. The exchange bureau, for example, might collect hundreds of photographs of good window displays, and then, at the request of individual subscribers who found themselves in need of suggestions, a number of appropriate pictures could be forwarded for inspection.

Moving window displays might also be listed, and even routed from place to place as used by successive central stations. Price cards could also be prepared by the bureau's sign writers, at a price merely enough to cover the cost of production. The bureau might also act as a "brain brokerage" office for high-class central-station employees, salesmen, commercial men and others. By co-operating

with the advertising departments of the various large manufacturing and central-station companies much effort could be saved, and advertising material and cuts might be filed for co-operative use. Instructions could be furnished dealers concerning improved merchandising methods. Printed forms might also with advantage be furnished for shop use.

The Electrical Development Society, continued Mr. Lowenthal, should exercise a rigid censorship over unsafe electrical appliances, a delinquency in which the department stores, with their cheap apparatus, are the principal offenders. Clippings might also be collected from various commercial and trade press sources for the further dissemination of such practical ideas where they might do the greatest good. The good offices of the society could be used to advantage, too, in the adjustment of sales policies.

The Appliance Sales Opportunity

In one of the most elaborate discussions among those received by Mr. Martin, Mr. Frank Seaman called attention to the development of both the existent market and the latent market for electrical utilities. Conditions in the electrical industry, he pointed out, have not reached the severe competitive degree found in the older and more saturated fields, as in the drug and dry-goods trades, where sales campaigns are sometimes undertaken with forlorn hopes of reaching an already full market. The overstocked condition which prevails in the older markets does not yet affect the commercial efforts of central-station activity; but the future, predicted Mr. Seaman, will require in the central-station field an intensity of effort that has been hitherto unknown. The correspondent suggested methods of getting into the latent market, and pointed out that the thought of cost is one of the dominant negatives tending to hold back development in this field.

As an example, citing the lack of saturation to which electrical merchandising has been carried at the present time, the writer reported on the replies from 673 women subscribers to a woman's magazine, scattered throughout twenty-six cities of the country. Of the 673 answers received, 526, or 78 per cent, of the women reported that they already use electric light in their homes. In answer to the question "Would you welcome the general use of all kinds of electrical appliances in your own household?" 497 replied "Yes," indicating their lively interest in electrical labor-saving devices and conveniences. Seventy-five per cent of the number reported using electric irons, 31 per cent vacuum cleaners, 27 per cent toasters, 23 per cent fans, and 14 per cent percolators. Of all the other appliances on the market none reached a greater proportion than 6 per cent in use by these 497 women. These figures illustrate, said the correspondent, that, despite the large number of women greatly interested in electrical devices, the total number of sales accomplished to date still leaves an enormous unsatisfied and latent market. The whole question of electrical development, he concluded, is that of the cost to the user, a problem which, he added, has not yet been successfully solved by the manufacturer, central station or dealer.

Educating Builders and the Public

Mr. S. G. Hibben referred to the necessity of educating the contractor and the architect on the proper use of light, and recommended the broadcast distribution of the Illuminating Engineering Society's "Primer," as already suggested by a previous correspondent.

Mr. W. A. Wadsworth recommended the appointment of traveling representative to exchange ideas and bring about better local co-operation.

Mr. M. A. Edson suggested the organization of traveling electrical shows and exhibits, which might be drawn upon by various subscribers for exhibition in their own neighborhoods.

A Traveling Central-Station Exhibit

Mr. John F. Gilchrist, assistant to the president Commonwealth Edison Company, Chicago, described some of the suburban plans of the Middle West Utilities Company, an Insull subsidiary. This company has purchased a new railway car, which is to be equipped with electrical devices as a moving exhibition capable of being transported from town to town along the syndicate's transmission system. The advent of the car in each community will be preceded by an advance agent, who will arrange striking advertising in circus style, preparing the local community for the coming event, and stimulating interest in the central-station exhibit. The car will also be equipped with a moving-picture machine, to provide entertainment as well as instruction by means of special central-station films posed by the Chicago company's representatives. In closing, Mr. Gilchrist recommended that central stations "take their own medicine," to a greater degree, in the use of outdoor advertising by means of electrical signs in their own communities.

Mr. S. L. Coles recommended the standardization and formulation of uniform electrical ordinances and the improvement in existing legislation. Particular objection was raised by him to the cards sometimes found in hotel rooms warning guests against the use of electric irons or devices as a source of danger or fire. Such signs suggest the existence of a fire hazard with electric devices, which is not present.

Suggestions for Commercial Development

Mr. F. B. Rae, Jr., pointed out that the barrier which now most interferes with the development of the industry is the inertia found in various branches of the field. To counteract this, he declared, there must be an aggressive publicity campaign applied to and supported by the entire industry. Such a campaign is needed to educate and stimulate central stations, contractors and dealers. In furthering this result, he insisted that suggestions of all kinds be accepted on their merits, regardless of source or authorship.

Mr. Rae declared that there exists a need for more business books on the commercial side of electrical merchandising and sales. Some of the subjects for which he recommended more adequate treatment are business methods for contractors, store arrangement, bookkeeping, merchandising, window trimming, etc. He also suggested the establishment of an advisory council, whose assistance individual companies might call upon in deciding upon expenditures in publicity campaigns, sales undertakings, etc. Another useful department would be one for compiling research and statistical data. This information should then be furnished to professional writers, he proposed, to arrange in attractive form for distribution to the popular press.

Mr. Dana Pierce, of the Underwriters' Laboratories, urged that the Society for Electrical Development advocate the use of approved electrical devices.

Interesting Other Industries

In opening the discussion, President Doherty explained that with the wealth of suggestions that have been received the problem becomes chiefly one of selecting the material of most value. While the problems of selling can be discussed learnedly and in academic fashion, "it often takes a roughneck," said Mr. Doherty, "to go out and sell!" The speaker then cited a number of interesting and successful plans and methods by which central stations can improve their local business.

Manufacturers Who Should Use Electricity

Mr. Doherty also proposed that the society urge upon those manufacturers who do their chief business with electric-service companies the advantages and advisability of electrifying their own shops and installing electric service

throughout their own plants. The assistance of the automobile interests, he also suggested, might be enlisted to secure more adequate lighting of country roads, thus obtaining the light for the automobilists and valuable revenue for local central stations. This is but an example, said Mr. Doherty, of the useful principle of letting other people help do for you things which will be to their mutual advantage.

One hotel, for example, completely equipped with electricity, at once becomes the basis or standard of local hotel construction, and thereafter it is simply a matter of routine salesmanship to equip similarly other new hotels as they are built from time to time. Mr. Doherty referred to the desire of the popular magazines for interesting news stories and proposed that a press-clipping bureau be patronized to provide hints from which professional writers might prepare attractive accounts of electrical devices, undertakings, etc.

Cities which legislate against electric signs, declared Mr. Doherty, are legislating against their own attractiveness. Many municipalities spend large amounts upon beautifying their parks and boulevards, yet fail to recognize that the illumination of their downtown streets is even a larger factor in bringing visitors and business and making their community attractive. Light brings a crowd, and a traveled street means business.

Technical Assistance from Outside

The Electrical Development Society, continued the speaker, will get valuable assistance from the government bureaus, especially along the lines of electricity on the farm. Much valuable and useful work might also be done by college students in the preparation of these, if proper subjects were suggested by some practical body such as the society. College seniors would welcome the opportunity to do useful work of this kind, and without cost to the industry they could render valuable service in attacking the solutions of both commercial and technical problems.

Mr. Doherty had a good word for the Jovian Order, commending its aims and declaring that the men who belonged to the organization "can do things." He also spoke with approval of the plan for a training school for commercial employees, declaring that in his own organization the value of this scheme had already been many times proved.

One way in which the local central station can reach many of the local manufacturing companies who are prospects for electric service, as pointed out by Mr. Doherty, is through the electric company's own board of directors, men in most cases allied with the various local industries. In almost every central-station community the membership of the electric company's board of directors reaches practically every local line, affording useful avenues of approach to securing profitable power and lighting business.

Electricity and the Automobile

Even the gasoline automobile, said Mr. Doherty, is being equipped with electrical appliances which have hitherto been overlooked by the manufacturers of electrical machines. The maker of one prominent gasoline car, for instance, is experimenting with no less than thirty new applications of electricity on his gasoline vehicles. Among these are hand projection lamps, useful in reading roadside signs and direction bulletins, and automatic electric lamps arranged to illuminate the sidewalk and step when the car door is opened. Possible applications thus outlined in the automobile industry alone should be worth $2,500,000 each year, estimated the speaker.

Gasoline continues to go up, making the cost of operating internal-combustion engines almost prohibitive. Indeed it is predicted that within a year or so the price will reach 40 cents a gallon, a development which cannot but work to the advantage of the electric vehicle. The need of the hour in the field of the electric car, however, declared Mr. Doherty, is a less costly vehicle, and he urged that unless some manufacturer soon supplies this demand the society itself encourage the production of such a car, going outside the electrical industry if necessary.

Getting the Old Houses Wired

Mr. T. F. Bludworth, of the Public Service Corporation of New Jersey, referred to the difficulty in getting old houses wired and urged that more attention be paid to demonstrating to prospective customers that with present construction methods house-wiring can be installed without injury or disarrangement of walls, furniture or household effects. Mr. Bludworth also insisted on the necessity of having men of suitable information, education and caliber visit customers and prospective customers, and declared that unless proper confidence is inspired by such calls it will be difficult to close desirable business. Moving pictures have been employed by the Public Service Corporation to demonstrate the conveniences and comforts of electricity to prospective customers.

Mr. Converse D. Marsh called attention to the value of general publicity campaigns in supplementing the work of salesmen by presenting his arguments in advance.

Mr. C. G. Durfee, of the Rochester Railway & Light Company, Rochester, N. Y., reported that his city has 1200 to 1300 industries, and that his company will co-operate in every way possible with the efforts of the Electrical Development Society.

Mr. Robert Ely, of Philadelphia, suggested that when educative lectures are given to promote central-station development these be held in unwired churches and buildings, the charge for admission being devoted to wiring the structure and thus securing additional customers for the local central station.

Reaching the Coming Generation

Mr. Edward L. Bailey proposed that lecturers shall receive salary and expenses to travel among rural high schools and lecture to the high-school students, in this way reaching future farmers and citizens with instructive information concerning the uses of electricity in agriculture and the industries.

Mr. Burton Emmet said that the average family becomes a user of electric light, toilet soap, pianos, automobiles and other so-called luxuries as soon as it has reached a degree of affluence where these can be afforded. No criticism is ever made of the cost. Of the 10,000,000 houses in this country, said Mr. Emmet, only one-fifth are equipped with electric lamps.

Mr. G. H. Barbour recommended that the society take recognition of new inventions brought out, especially those of foreign origin.

Mr. Norman Macbeth, editor of *The Lighting Journal*, pointed out the necessity of salesmanship in commercial relations between manufacturer and consumer, and urged upon the society the necessity of properly looking after the interests of "the man between."

Mr. G. A. Stickney closed the discussion with a brief reference to the necessity of safety precautions.

MORNING SESSION, MARCH 5

The morning session on Wednesday, March 5, was called to order at 10:15 a. m., with Mr. A. W. Burchard, of the General Electric Company, New York, in the chair. The first paper to be read was entitled "Co-operation in the Electrical Industry," by Mr. J. Robert Crouse, National Quality Lamp Division, General Electric Company, Cleveland, Ohio. In view of the detention of Mr. Crouse the chairman called upon Mr. F. E. Watts to read Mr. Crouse's paper.

Co-operation in the Electrical Industry

The author stated that during 1905, 1906 and 1907 it had been his mission to raise the entire question of co-operative market developments in the electrical business as a trade and economic issue.

At the St. Louis convention in 1910 Mr. E. A. Sperry, in

reviewing the work of the association, remarked that it was on the threshold of advances during the approaching quarter century as great as those which had taken place in the quarter century then just elapsed. He indicated that future developments were destined to follow commercial lines very strongly.

The author predicted that engineering matters will be radically subordinated within the next few years to purely commercial questions and especially to the problem of developing salesmanship. Improvements in the economy of operation viewed from the standpoint of increased revenues are not to be compared with the possibilities in the direction of increasing the market for the sale of electrical appliances and electrical energy. Here the interests of the central station and the manufacturers are oftentimes identical, and co-operation is highly essential.

CO-OPERATION A RECOGNIZED FACTOR IN INCREASING DISTRIBUTION

Commercial co-operation, said the author, is a thoroughly accepted principle and a recognized factor in increasing the efficiency of production and distribution. In other words, men can accomplish more through collective effort than by segregated or individual effort inevitably accompanied by wasteful conflicts and opposite purposes. Within a comparatively brief period business has passed consecutively through the period of individualism, co-partnership, corporations, consolidations, syndicates and associations. Each advance has been in reality a recognition of the co-operative principle and has tended to restrain such competitive effort as inherently tends to defeat its own objects. In the field of manufacture or production there has been an enormous gain in efficiency as a result of specialization, co-ordination and co-operation. On the other hand, selling and distribution have made little gain in efficiency, notwithstanding steady progress in the refinement and perfection of organization. Production has been subject to the advantage of the economic law of increasing returns, while distribution has been subject to the law of diminishing returns. Some plan of co-operative commercialism which will place distribution under the economic law of increasing returns will unquestionably appeal to all.

The author next considered several propositions, the first being whether the $18,000,000,000 of wealth annually produced in this country is not unduly diverted from the purchase of electrical appliances and electrical service to the attainment of mere luxury and the purchase of such things as automobiles, pianos, phonographs, etc.; second, the question whether a practical plan cannot be devised to alter this condition, and lastly whether these plans, per unit of money and effort expended, will not yield a better return than it is now possible to secure.

HOW TO PROMOTE CO-OPERATION

Manufacturer, jobber, dealer and central station are therefore all equally interested in educating the public to the advantages of electrical service. Among the agencies proposed by the author for securing this result are a national campaign of advertising, a national electrical press bureau, the use of advertising service through agencies, the creation of new business departments in the technical press, the establishment of schools of electrical salesmanship, sending out field men among lighting companies and electrical contractors and allied trades, the distribution of a suitable commercial literature to the different trades, and, finally, the offering of special prizes for excellence in commercial work such as those which resulted, for instance, in the "Solicitors' Handbook" of the N. E. L. A. Local electrical leagues, such as the one that has existed for several years in Cleveland and was recently consolidated with the local Jovian League, have done much to spread popular knowledge of the advantages of electrical service. One of the tangible outcomes of this work is the so-called "People's Electrical Page," which appears twice each week in certain leading newspapers. This page is supported by the local central-station company and the various jobbers and contractors. The author said that similar leagues have been formed in fifty cities and "people's pages" started in fifty newspapers, with an aggregate annual circulation of 50,000,000 copies. These instruments of co-operation offer an excellent opportunity for increasing the general good-will of the public toward the electrical business as a whole, he thought.

The organization of Past-Jupiters of the Jovian Order has created a fund of about $3,500, and has an annual income now exceeding $1,500. A movement is also under way in Cleveland to establish a two-thousand-dollar fund in connection with the Jovian League, the income of which will be used to promote the objects of the order. An association of Past-Presidents of the Society for Electrical Development is also proposed, and Mr. Crouse offered to pledge himself personally in the sum of $5,000 as part of a minimum fund of $50,000 to be used in promoting the work of the society.

Discussion.

The chairman called on Mr. E. W. Lloyd, of the Commonwealth Edison Company, Chicago, and also chairman of the Commercial Section of the N. E. L. A., to discuss the paper. Mr. Lloyd stated that the Commercial Section was founded at the St. Louis convention in 1910 through the efforts of Mr. George Williams. At that time those interested in this new section were not clear as to exactly what work it should undertake, but the leading men in the central-station industry were unanimous in their opinion that the commercial side of the business was undeveloped and needed serious attention. The commercial section now has between 1200 and 1500 members and has devoted itself mainly to the distribution of up-to-date information and data which will help central-station salesmen in securing new business. Substantially nothing has been accomplished in the direction of developing salesmen or teaching salesmanship. The officers of the section have devoted their limited income to such work as seemed to promise the largest immediate returns. Data are now distributed by the section four times a year. Mr. Lloyd stated that real salesmen with technical knowledge and central-station experience are much in demand. He emphasized, also, the fact that there are altogether too few good books on central-station salesmanship, there being less than a half dozen which can be recommended. He also stated that those who have charge of advertising do not publish the right kind or enough data. In closing the speaker announced that the program for the Commercial Section at the Chicago convention will be short in order to devote as much time as possible to discussion.

THE SALES END

The author of a paper entitled "The Sales End," Mr. James H. Collins, of New York, opened his discourse in a humorous vein and traced the descent of the present-day electrical salesman from the lightning-rod agent of a couple of generations ago. The father of all salesmen, said the author, was the book agent. The lightning-rod man was undoubtedly deficient in technical knowledge, but well equipped in the psychology of salesmanship and understood how to "put it over." The modern central-station salesman essentially needs instruction in the art of salesmanship. Successful selling methods differ with each industry, but in all cases the adoption of the proper spirit or attitude on the part of the salesman is fundamental. In referring to the frequent lack of alertness on the part of central-station salesmen, Mr. Collins mentioned a new type of laundry machine for performing an operation styled "wet-washing," which he said is likely to become an important supplement to the electric iron in building up the central-station business. This is a washing machine which turns out the washed materials just damp enough for ironing.

In referring to the objections advanced by some central-station companies against the distribution of electrical appliances through retail dealers, the author stated that this, nevertheless, is the modern method of distribution. The merchant, said he, must always stand behind the quality of his goods, just as the contractor should stand behind his installation or the central station behind the quality of its service. The jobber, who is a middleman, fills a real want and is virtually a clearing house. Electrical appliances, the author emphasized, must become universally known by the public, and to this end the co-operation of all interests, each in his proper sphere, is essential.

President Henry L. Doherty took the chair and asked that discussion of the preceding paper be postponed until the presentation of Mr. Robertson's paper, an abstract of which follows.

Merchandising Co-operation

Mr. W. E. Robertson, vice-president of the Robertson-Cataract Company, discussed the subject of "Merchandising Co-operation," and by way of introduction remarked that many of the points which he wished to make had already been covered. While having no quarrel with the selling methods of the past for the development of the electrical industry, the speaker voiced the opinion that in the merchandising of electrical appliances a new day has arrived. The retail dealer, he stated, could make a very handsome net profit if the central-station company would charge up to merchandising cost all of the elements of expense such as rent, light, heat, general expense and depreciation. The speaker stated that he had investigated the comparative number of business failures among jobbing concerns and among manufacturers and found to his surprise that failures among the former class are almost unknown, whereas they are comparatively frequent among manufacturers.

A Good Business Location Essential

Mr. Robertson explained that his concern makes a very careful study of its points of distribution and notes especially the factors which make for the success of the dealer and the contractor. His concern also keeps in close touch with merchants, associations and organizations. Location, he explained, has more to do with a dealer's success than any other one factor, as proved repeatedly by the experience of the Woolworth five and ten-cent stores and the United Cigar Stores. Experience shows that people as a whole will not go out of their way to satisfy their desires or wants, unless compelled to, and the successful dealer must offer his goods to the public at a location which suits its convenience. If the goods are brought to the people, so to speak, they can be marketed at a very low cost.

Retail Competition Necessary to Stimulate Merchants

Retail competition, in the speaker's opinion, is a good thing and necessary to the development of keen, alert merchants. Under a state of monopoly in retail trade, stagnation is likely to result. Retail competition is preferable to monopoly which puts prices so low as practically to exclude competition. The development of keen, responsive, intelligent merchants and the wide and effective distribution of merchandise require retail competition. Among the important factors in retail mercandising are location, window display, courtesy, newspaper advertising and direct appeals from the counters of the shop or store. In selected locations retail stores to-day are justified for electrical merchandising in communities where the central-station company is not retailing appliances at cost or below and recovering the margin of profit in the price charged for electrical energy.

Dealer Can Gain Confidence More Easily Than Central Station

Under equal conditions, declared Mr. Robertson, a retail dealer can outsell a central-station company. It is also easier, the speaker stated, for a local dealer to obtain the public confidence than for the central-station company to acquire it. The sales of his concern to large industrial concerns are so much larger than sales to retail dealers that the latter are really only incidental. In concluding his remarks, the speaker repeated his conviction that retail stores for merchandising electrical appliances can be started and successfully maintained in many localities if there is substantial and effective co-operation among all the interests involved.

Discussion

Mr. W. H. Johnson, assistant to the president Philadelphia Electric Company, Philadelphia, Pa., took the chair, and Mr. Henry L. Doherty then opened the discussion on the group of papers just presented. He agreed with many of the statements made by Messrs. Collins and Robertson but said they had not completely stated the central-station problem. Mr. Doherty agreed that every article of trade should be sold at a price which would net a profit. Speaking of jobbers and middlemen generally, he called attention to the public antagonism toward corporations, which commenced to assume serious proportions some years ago, and the more recent antagonism toward the middleman, who is supposed to be responsible in some degree for high prices. However, the public is coming to realize, according to Mr. Doherty, that the middleman is a necessary factor, and antagonism toward him will probably diminish hereafter.

Fixed Retail Prices Advantageous

The speaker also voiced his sentiments in favor of placing trade articles on the market under fixed retail prices and referred to the situation in Congress, where a bill is pending which would take away the patentee's right to fix the re-sale price on his patented article. The advantages of price-fixing in retail trade were pointed out, the speaker using the well-known Ingersoll dollar watches as an example. The fixing of the retail price prevents other concerns, said Mr. Doherty, from capitalizing unfairly and profiting by the large expenditures of the Ingersoll company for advertising. If such articles as dollar watches are to be successfully marketed they must be turned out and sold in immense quantities, in order to make the cost of production low enough.

Turning to the subject of retail competition in electrical appliances between the central station and the local supply dealer, Mr. Doherty differed with Mr. Robertson, and stated that some of the dealers who compete with his companies do not obtain more than 10 per cent of the total retail trade. He also expressed his belief that the public as a whole has more confidence in devices marketed by central-station companies than in those offered by dealers.

Low Prices Do Not Compensate for Poor Service

The great public cry for low prices is based, in the speaker's opinion, on an economic fallacy, and low prices do not and can never compensate for the poor service which is their inevitable accompaniment. The speaker then said that Mr. Robertson had overlooked one of the most important features of merchandising, which is systematic canvassing. The Doherty companies carry on such canvassing according to a well-developed plan and call upon every house, store and business or industrial concern. Much business is secured by this method and by means of a follow-up system. Those who do not take the service at once are often secured later. This practice, declared the speaker, helps to gain public confidence and makes it easy to get new business. Among other things, it is a distinct factor in making sales of electrical appliances. Such campaigns are generally supported by indirect appeals through the advertising columns of the newspapers. This is a source of expense to which contractors and dealers are rather reluctant to contribute their share, although this is not the invariable rule.

THE QUESTION OF LAMP SUPPLY

The most critical problem in merchandising which the central station has had to solve is a question of lamp supply. When the tungsten lamp came into commercial use the local dealers were induced to offer these lamps to purchasers on the basis of more light for the same expenditure. It was found, however, that many dealers soon broke away from this policy and advocated the same light for a less expenditure, which has a tendency to cut down the central-station company's sales of electrical energy. In order to meet this situation, Mr. Doherty explained that he adopted the policy of cutting the price on tungsten lamps to so low a point that the dealers could not continue to handle them in competition at a profit. In speaking of the effect of introducing defective appliances Mr. Doherty referred to his own efforts, some years ago, for the introduction of electric flatirons in a certain city before they had been thoroughly perfected. The resulting failures made the public so skeptical that this particular city was afterward found to be the most difficult of all in which to introduce electric irons when their commercial success had been established beyond question by general experience. He also referred to the fact that the central station has a decided interest in keeping its customers' appliances in efficient working order and in this respect is in a different position from the local dealer. In closing his remarks Mr. Doherty said that he had many times expressed his wish that some one would devise a scheme for co-operation which in its application would benefit all and injure none, but he had yet to learn of such a plan. He is still hopeful, however, that the problem can be solved.

INSURING DEALERS A LIVING PROFIT

Mr. W. H. Johnson then took the floor and stated that the co-operation problem had been solved with respect to the local conditions which are found in Philadelphia. The lamp problem has presented the greatest difficulty, and it is found essential to retain control, if possible, of the sales of lamps which will be used by customers. The commercial policy adopted by the Philadelphia company in retailing electrical merchandise has been to "live and let live," and in general it has fixed retail prices on a scale which will permit the local dealers and department stores to do business at a net profit and make a decent living. It still has occasional sales at cut prices in order to stimulate the introduction of some particular appliance when this seems to be warranted. The Philadelphia company attempts to compete with local contractors only in the cases of emergency work on a large scale which the contractor is not usually equipped to handle. In support of his company's policy not to relinquish control of the lamp question with respect to the lamps which will be used on customers' circuits, Mr. Johnson cited the case of the gas companies, which quite generally left the sale of gas mantles to retail distributers. The companies have found through experience that this is a very poor policy and are now coming around to the practice of the central station companies, having learned that by this means the customer receives better treatment and much superior service. In referring to salesmanship, the speaker said that the most common failing of central-station solicitors is to talk too much, thereby in some instances incurring the customer's distrust. Salesmanship is a fine art, and one of its most important attributes is the ability to size up the human characteristics of the prospective customer.

Adjournment was then taken until 2 p. m.

AFTERNOON SESSION

When the conference was called to order at 2 p. m. discussion of Mr. Robertson's paper was continued. Mr. C. W. Stone, of the General Electric Company, was the first speaker.

He said that the manufacturer is naturally anxious for all the co-operation he can get, as a means of pushing his product. He expressed himself as greatly in favor of specialized effort. While those in the central-station business are usually a highly specialized class as regards the manufacture and sale of electrical energy, it does not follow, he thought, that they are necessarily merchants. The dealers and jobbers, therefore, have a very distinct part in the development of the central station's business.

With the central-station company, however, the interest centers in filling up the valleys in its load curve and diversifying the load, and the profits from the sale of appliances are therefore of secondary interest. The dealer, on the other hand, is dependent on the profits in his sales, so that his interest is large.

Nevertheless, the central station has had to take the lead in many cases in creating a market for appliances. On account of these efforts taken by the central stations, manufacturers have been glad to get their help in introducing new equipment.

HIGH FIRST COST RETARDS SALES

Some appliances, the speaker pointed out, are frequently difficult to sell, owing to their high first cost. To show how this difficulty may be offset to some extent, the speaker related the experiences in his household after the introduction of an electric washing machine costing $100. This machine had great self-advertising powers, as it had proved to be a source of intense interest to the women visitors and had also been an excellent labor-saving appliance.

LACK OF FOLLOW-UP METHODS

Lack of a follow-up system to see if appliances are properly installed or are in working order was next discussed by Mr. Stone. Oftentimes small devices are neglected and then fail to give satisfaction. It was hard to say, he thought, who could do the following up to best advantage. The manufacturer could hardly be expected to do it, and, moreover, he doesn't even know the customers. The dealer, he felt, was particularly remiss along this line. An automobile dealer, the speaker continued, does follow up his sales by keeping in touch with his customer and using every effort to see that he is satisfied with his purchase.

With the electrical dealer such interest and attention are felt and given only occasionally. In other words, they do not characterize his work as a regular thing. The central-station company, he continued, might do the work. A plan to do the work and divide the expense might be effected by the jobbers, dealers and central-station companies. Such a plan would be a great help to all concerned.

The manufacturer, the speaker explained, needs a great deal of help from all sides in carrying on his research work and wants to know what demand can be created for new products. Some information along this line is given by central-station companies, but there was not, the speaker said, a concerted effort made in this direction by the industry.

In conclusion, he stated his belief that the society can help the manufacturer to develop along lines which will be of the greatest benefit to the central-station company, the dealers and all concerned in the advancement of the industry.

"DECENT BUSINESS CONDITIONS" THE DEALER'S ONLY PLEA

Mr. J. R. Strong, of New York, was the next speaker. He stated that Mr. Ernest Freeman, of Chicago, president of the National Electrical Contractors' Association, was to have been present to discuss the paper, and that his own remarks would, therefore, be impromptu.

Regardless of whether concerns were engaged in business solely as a jobber, or a contractor, or a dealer, or in all of these lines, they are all middlemen. It might be possible, he thought, to create some plan, through the "harmony department" of the society, that would bring about the sale of electrical merchandise at a profit to all.

The establishment of merchandising conditions, however, would help most. Co-operation, according to Mr. Strong, generally means treating with the other fellow as long as he does what you want.

The central-station company, he said, co-operates only in so far as it suits its convenience. It sells lamps because the dealer does not sell them fast enough to suit it and holds special sales of appliances at prices to suit itself.

All that the contractor asks of the central-station company, he continued, is decent business conditions. He referred to Mr. Doherty's criticism that the contractor doesn't push. This, the speaker said, was because the central-station company is a monopoly in each place and can spend, say, $100,000 in advertising which does not come out of profits from appliance sales. Such practices prevent the middleman from making much profit, because he has to deal in a small way.

Manufacturer Often Undersells Local Dealer

The manufacturer, he maintained, is as much at fault as the central-station company. He sells directly to the customer time and time again, and often quotes to a large customer lower prices than to the men legitimately engaged in the electrical business. In other words, Mr. Strong said, the manufacturer will simply cut prices at random to make a sale.

The establishment of a price schedule he did not consider to be any concern of the society; he did think, however, that the society can help to establish more harmonious conditions.

Someone Must Concede a Point

Whenever, Mr. Stone asserted, the central-station company maintains a price that is fair to the dealers and contractors the latter invariably get the business. The middlemen throughout the country are prepared to spend money to get business, provided there is sufficient profit to be made from this. Someone, therefore, has got to concede something, and the middleman, he claimed, cannot be the one to do this. The bulk of business which he does, as compared with that of the central-station companies and the manufacturers, was exceedingly small as far as gross sales are concerned. He again expressed the hope that through the society such troubles can be eliminated.

Harmony work, Mr. Strong believes, cannot be done on a national scale, but can be accomplished best by work in each locality.

The jobbers and dealers can grow as soon as conditions permit, and these conditions should be brought about, the speaker felt, by the extensive interests represented in the society. Much improvement has resulted from the work of the National Electric Light Association since he presented some of the facts to it, but, the speaker felt, there is yet room for a great deal more.

Doherty Companies Aid Middlemen

Mr. Doherty stated that the central-station companies in which he is interested have conceded a great deal to the middlemen and had turned over much wiring work to the local contractors whenever the latter were able to do the work. The solution of the problem, he held, cannot be reached by harsh methods and must be arrived at through careful consideration.

Thinks Groups Can Never Agree

Mr. Max Lowenthal stated that he was greatly out of harmony with all that had been said. By heredity, he said, he was enabled to see merchandising in its true light. The diversity of opinion that had been expressed was pleasing to him, but, he insisted, the various groups will never agree; it would not be consistent with human nature for them to do so. Electrical men, he said, have never been merchants, in the sense that the word is used in other lines. He doubted whether electrical men were the right sort of men to merchant their own products.

The whole, he felt, is a personal, human problem. "It is nobody's business how you do your business," he said, "as long as it is done honorably." It is impossible, therefore, to try to harmonize. He then told of his experiences when, some ten years ago, he established an electrical shop in one of the New York department stores. He wanted to sell the appliances to women, so he had naturally established it where women go to shop. There had been a great protest against this from local dealers, but he had gone ahead and the venture had been successful. Department stores, he claimed, will conduct their affairs as they see fit, and will not ask price schedules for appliances from local central-station companies. In other words, they adopt an independent policy, in which, he stated, they were successful. They will cut prices if they think they can stimulate sales, so that even if harmony is established between the jobbers, the dealers and the central-station companies, the latter will still have the department stores, with their appliance departments, to compete with.

Despite their aggressive or merchandising methods, the department stores, he said, do not sell appliances intelligently. Oftentimes those placed in charge of the appliance departments in such stores are entirely lacking in knowledge of the devices and the cost of operating them. What the society should do, instead of decrying these practices, is to teach department store methods to electrical men, who could then compete with the stores on their own level. The whole question, he felt, is a local one. In a small place the central-station company will always sell appliances because there is usually no other concern or individual competent or interested enough to handle them.

A Follow-Up System Used on Pacific Coast

Mr. H. E. Woodill, Los Angeles, said, in answer to Mr. Stone's statement that there is no follow-up system in general use by dealers, that his concern paid particular attention to this desirable practice. In their advertisements in the daily press, they say: "Buy your goods from an electrical store; we will take care of them for you." He added that of several of the lighting companies that operate in his territory one of them sells appliances at prices far below those at which the dealer can profitably handle them. The other two companies give the dealers lists of names from which they try to pick up business. Mr. Moore said that, prices being equal, the dealer will usually get the greater part of the business; hence if such price levels were maintained, the dealers would have no grievance.

Co-operation the Keynote

Mr. C. G. Durfee, Rochester, said that co-operation is the keynote of the whole question. The great majority of electrical men, he thought, do not know how to co-operate. He stated that his company had tried to co-operate with the electrical contractors in Rochester; a practice of holding monthly dinners with contractors had been instituted, and since then about 80 per cent of the old troubles have disappeared, as a result of the satisfactory talks which took place at the dinners and the co-operative spirit that had been fostered. Many of the contractors have also joined the Jovian Order, he said, and, all in all, the situation has been wonderfully improved.

An Example of "Co-operation."

Mr. W. H. Weekes asked for a definition of co-operation. He told of a Southern central-station company which would not buy lamps from him because it wanted to buy from the contractor and thereby co-operate with him. It had developed later on that contractors were buying 16-cp carbon lamps from free-renewal customers and selling the lamps back to the central-station company.

Mr. Ayer stated that the general tenor of the remarks had taken his thoughts back some twenty years to the time when he was in business in St. Louis and had brought

twenty local electrical men together at a luncheon for the first time, and had thus paved the way for an electric club from which splendid co-operative results had been obtained. Prolonged discussion of policies and methods, he thought, was merely incidental.

BOSTON EDISON'S SHOWROOM POLICY

Mr. Ayer also spoke of the opening of an electrical showroom by the Edison Electric Illuminating Company of Boston, some ten years ago, at an expense of $20,000 a year. At that time the company sold only electrical energy. It was planned merely to show goods and to direct prospective customers to the dealers. The latter, however, did not carry full lines, so that the manager of the showroom was authorized to sell appliances on his own account. Several thousand dollars' worth of appliances were sold in a year in this way, and the showroom was enlarged. The policy, however, has been, he said, to sell at retail prices with which the dealers can compete, and this policy, he stated, has had a successful outcome. Now that the demand has been created, the dealers are encouraged to sell on a larger scale. At present, Mr. Ayer said, the Boston company sells only one-third of the appliances purchased in its territory. He commended the policy to those present as an excellent one to pursue.

Owing to lack of time, the discussion was closed by the chair after Mr. Ayer's remarks. Mr. Doherty then said Miss Harriet Billings, assistant secretary of the National Electric Light Association, was in the hall, and paid a warm tribute to her untiring efforts in behalf of the electrical industry.

SUMMARY

Mr. Robertson, summing up, said that he had found that his subject had opened much valuable discussion and that he believed the success of the entire movement rested wholly on its application to local conditions. Conditions in Philadelphia, he said, are harmonious; in Cleveland, ideal, and in Boston, splendid.

He thought that merchandising prices should prevail. The middleman, he asserted, is one of the most stable institutions of the country. Referring again to the methods of selling Ingersoll watches he stated that it is absolutely essential to maintain the price of them in order that the selling methods shall be successful.

The middleman, Mr. Robertson said, cannot realize on the capitalization of his earnings as the central-station companies can, but must make his profits on his actual sales. He did not agree, he said, with Mr. Lowenthal's statement that department store merchants act independently and make prices to suit themselves in their respective fields. They have their own associations at which prices, etc., are discussed. The whole idea of the society, he said, is to make a greater market for electrical merchandise, and there is a greater opportunity for all on the platform of co-operation.

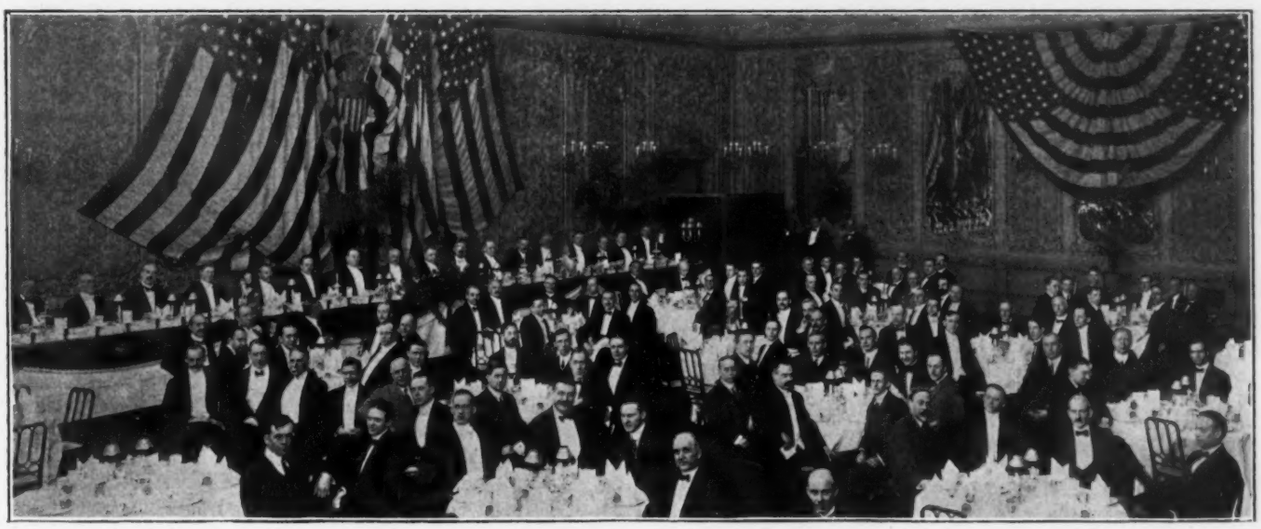
He agreed with the statements that no set rule to be used nationally can be made, and that the work must be done locally.

The dealer does not ask the central-station company to stop selling equipment, Mr. Robertson said; but only to make merchandising conditions in which all can share.

He said also that through lack of attention or thought, men of too radical a nature in any of the four groups represented in the society might inject a note of bitterness that would be foreign to the society's purpose and death-dealing in its effect on local co-operation. He hoped that would not be the case.

AN ELECTRICAL ADVERTISING CAMPAIGN

Mr. Doherty next introduced Mr. William D. McJunkin, of Chicago, who read an exhaustive paper in which he suggested a plan for an electrical advertising campaign to be carried out by the society. Mr. McJunkin said that the idea of the society had first seemed to him to be baffling in its magnitude, but that he had finally been able to lay out a definite course that might be pursued.



THE BANQUETERS AT DELMONICO'S WEDNESDAY NIGHT

In connection with his paper, he had prepared a large chart showing in a concrete form the work to be done by the society. Copies of this were given out to all present. On this he had classified the work under three heads: "Extensive," "intensive" and "follow-up."

After telling the purposes of the chart, Mr. McJunkin took up his plan for a comprehensive advertising campaign for doing the work under these three heads. Going into great detail, he told of the class of copy that should be used for developing the use of electrical energy and of appliances using light, heat and power for services in the home, office, store, shop, factory, public and semi-public buildings, for municipal purposes and for festivals.

In each case he named the magazines or other advertising mediums which should be used and told why; proposed the amount of advertising space to be used in each of these publications, and specified how much money should be appropriated. He also pointed out the kind of advertising copy that should be used in each case, giving his reasons.

He spoke of the large amount of advertising that is being done by telephone and telegraph companies, and said that, in his opinion, the society need not give any publicity

to these fields, as they are already very well exploited.

In the same way, the Electric Vehicle Association of America is carrying on a sufficiently vigorous campaign, so that the society need not spend any money for advertising that field. He thought, however, that it would become an important factor in the society's affairs in time.

N. E. L. A. Commercial Section Booklets Valuable Aids

Mr. McJunkin stated that the booklets that have been prepared by the Commercial Section of the National Electric Light Association were doing an excellent work and could be used to advantage by the society in carrying out its publicity campaign. He advocated a monthly booklet to be sent to homes.

He also spoke of the value of moving-pictures as a productive advertising medium for the electrical industry and suggested that the society adopt insignia or a trade-mark.

Mr. W. H. Johnson, the temporary chairman, said he considered Mr. McJunkin's paper in the light of a guide for the executive officers and executive committee.

Mr. W. J. Clark, of the General Electric Company, stated that he wished to call attention to one thing that had not been mentioned, one of the greatest features in the electrical industry of the present day, namely, the electric railway load. This, he said, is rapidly coming closer to the central stations owing to the rapidly growing policy of electrification of steam roads.

Mr. Wakeman announced that the executive committee would begin on March 6 to digest all that had been proposed and discussed at the conference.

Owing to the lateness of the hour, further discussion was stopped and several reels of moving pictures depicting the uses of electricity were shown. These were given through the courtesy of Mr. J. C. McQuiston, of the Westinghouse Electric & Manufacturing Company.

WEDNESDAY EVENING'S BANQUET

Wednesday evening about 125 of the men who had attended the two days' sessions of the society, together with a number of guests, dined at Delmonico's. At the speakers' table were Messrs. Gerard Swope, W. A. Layman, F. E. Wallis, W. E. Robertson, Frank E. Watts, P. S. Dodd, Frank M. Tait, A. W. Burchard, T. C. Martin, J. H. McGraw, Don Seitz, H. L. Doherty, J. M. Wakeman, Guy E. Tripp, W. H. Johnson, C. W. Price, Louis Wiley, James H. Collins and J. E. Montague.

When the speaking began President Doherty surrendered the toastmaster's chair to Mr. T. C. Martin, who characterized the meeting and the society it inaugurated as "a great force for the co-ordination and synthesis of all forces working for the progress of the electrical art and industry." The first speaker was Mr. Seitz, of the *New York World*, who as one explanation of his presence stated that his newspaper paid to the New York Edison Company $96,000 every year and was, he believed, the next to the largest customer on the books of the company.

By resolution, congratulatory telegrams were sent to Messrs. Thomas A. Edison, Charles F. Brush and J. Robert Crouse.

Views of Electrical Manufacturers

Following the reading of a letter from Mr. Charles A. Coffin, president of the General Electric Company, expressing the interest of his company in the work of the society and assuring it of his support, Vice-president Burchard reiterated Mr. Coffin's sentiments and, after outlining the trend of industrial consolidation during the last fifteen years, stated that the plan of the society indicated a means by which the results and efficiencies of concentration might be accomplished without antagonizing the public. He stated that he believed that the best way to do business was on the basis of equity and good-fellowship, and that the most potent influence of the society would be in promulgating this idea.

Similar views were voiced by Mr. Tripp, chairman of the Westinghouse board, and by Mr. W. A. Layman, president of the Wagner Electric Company. The latter gave assurance of the support of the "Central Western contingent," not only morally but in the form of substantial contributions.

Aims of the Jovian Order

Mr. F. E. Watts, Jupiter of the Jovian Order, pointed out that his organization was already trying to carry out the objects of the Society for Electrical Development, and that the Jovians had grown not only in numbers but in character, in serious purpose and in ability and determination to accomplish practical things. Mr. Watts said that the first step in co-operation was to make friends; this was the basis of harmony, and harmony was the best foundation for co-operation. He believed that the society would find that its most effective work must be done locally, and that wherever there was a Jovian league the society would find enthusiastic co-operators. "We are with you," Mr. Watts concluded; "use us as a means of accomplishing your great aims."

Co-operation from the N. E. L. A.

Following brief remarks by Mr. Wiley, of the *New York Times*, President Tait of the National Electric Light Association voiced on behalf of his organization hearty approval and support of the society and its plans and said that he hoped to be able in some way to convey to the N. E. L. A. members some part of the enthusiasm which had characterized this week's meetings.

Aid from the Technical Press

On behalf of the technical press, Mr. Hugh M. Wilson, vice-president of the McGraw Publishing Company, said: "You have got under way a scheme to educate the public, but don't forget that a good teacher must be well taught. That is where the technical press can be of great assistance to you. In a large measure, our electrical papers must become not less technical but more commercial, for whatever else they do they must represent the spirit of the times, and this spirit shows the constantly increasing predominance of the commercial element. What we have accomplished as technical papers is largely due to the assistance of technical men. On the commercial side we must develop in the same way—by your aid. Give us a chance to interpret your aims to yourselves and to the outside world. Give us your confidence; let us know what you are thinking and doing. I was greatly impressed by something that Mr. Doherty said about equipping representative industries 'to the last gasp.' In your first gasps and your last gasps, let us gasp with you!"

The Future of American Industry

Concluding the speaking, Mr. Doherty said: "I believe in my business, I believe in the corporations, and I believe that we occupy a position of importance in bringing prosperity and comfort to others. In working to develop electricity, we are working toward a higher and better civilization. Consolidations formed for good reasons and honestly conducted are bound to result in public good, but these consolidations are now under fire, and we are told that they are a menace to the people. I believe we have now hit upon a plan to get the benefits of co-operation, a plan that can harm no one and must bring good to all in the electrical business. It may be that the example we are setting here will mark the introduction of a new method for advancing supremacy, not only in the electrical but other industries. German industrial progress is due to the policy of business encouragement, not discouragement. Here we have antagonism and discouragement, and I fear the story of our future may not be as pleasant as the story of recent German industrial advance. To do what we can to correct this situation is one of the many important duties of this society."

Electric Railway in the French Pyrénées

Double-current generators utilized for supplying energy simultaneously to an 850-volt direct-current railway and a 20,000-volt, three-phase transmission system

SEVERAL unusual features are embodied in the equipment installed for the electrical operation of a standard-gage railway by the Southern Railway Company in the French Pyrénées. Use is made of the direct-current traction system rather than the three-phase system, and direct-current energy for traction and 25-cycle, six-phase energy for transmission are obtained from common generating units.

The generators are of the so-called "double-current" type, each being provided with a bar-wound armature connected at one end to a commutator of the usual type and at the other to six collector rings. They are compound-wound machines so proportioned that the commutator emf rises from 800 volts to 850 volts when the load varies from the no-load to the full-load value. The machine is provided with eight commutating poles, to eliminate sparking and allow the brushes to be kept in one position.

Each machine forms a unit with a step-up transformer, the primary circuit of which receives energy at 600 volts, six-phase, while the secondary end delivers it at 20,000 volts, three-phase. Each transformer has three vertical cores and is mounted in an oil tank, which is cooled by water circulation. Since each transformer on the lower floor is directly connected by a cable with the generator no busbars are necessary for these circuits. The advantage in using the double-current machine is the reduction in first cost, owing to the fact that no special direct-current generators are needed. This plan saves one generator set, since otherwise the station would require three alternators and two direct-current generators, one extra generator being held as a reserve unit.

Each generator, of which there are four, is a 650-kw machine driven by a 1500-hp Pelton waterwheel, to which it is connected through an elastic coupling. Each turbo-generator set is provided with a 5-ton flywheel 6.5 ft. in diameter, with a Minette speed governor of the oil-pressure type, and with regulators for guarding against the effect of water hammer. The turbines are operated under a head of 1375 ft. From a dam on the Tet River, an open flume 14,500 ft. in length brings the water to the settling basin, and from there a set of four penstocks lead to the turbine house, a distance of 3380 ft. At the station all four penstocks connect with a common pipe, which is laid below the floor of the building and has a branch pipe running up to each of the turbine-dynamo units in the floor above. The plant is located at La Cassagne, about 12 miles from Villefranche, which is the terminal of the steam railroad. From this place the electric railway extends up-grade to the mountain pass of La Perche at an altitude of 5220 ft. above sea level. After crossing the pass, the line proceeds upon a high plateau to the Rigat Pass and then descends into the Cerdagne plain, ending at the terminal station of Bourg-Madame, which lies near Spanish frontier, with an altitude of 3750 ft. The total length of the electric road is 35 miles, and the maximum gradient is approximately 6 per cent.

At five points along the road are located rotary-converter substations for feeding direct-current energy to the third-rail at 850 volts. All of the substations are similar in design. A step-down transformer of the air-cooled type receives energy at 20,000 volts from the three-phase line and delivers it at 600 volts, six-phase, to a rotary converter, which furnishes direct-current energy for the third-rail and is of the eight-pole type. These machines are built on the same lines as the generators in the main station. The rotary converters are started as direct-current motors with energy taken from the third-rail through an oil rheostat, which is operated from the switchboard panels.

The three-phase transmission line connecting the main plant and each of the substations had to be constructed near the railroad to facilitate inspection and repairs owing to the heavy snowfalls which are so common in the mountain region. A double line of six wires is mounted on pine

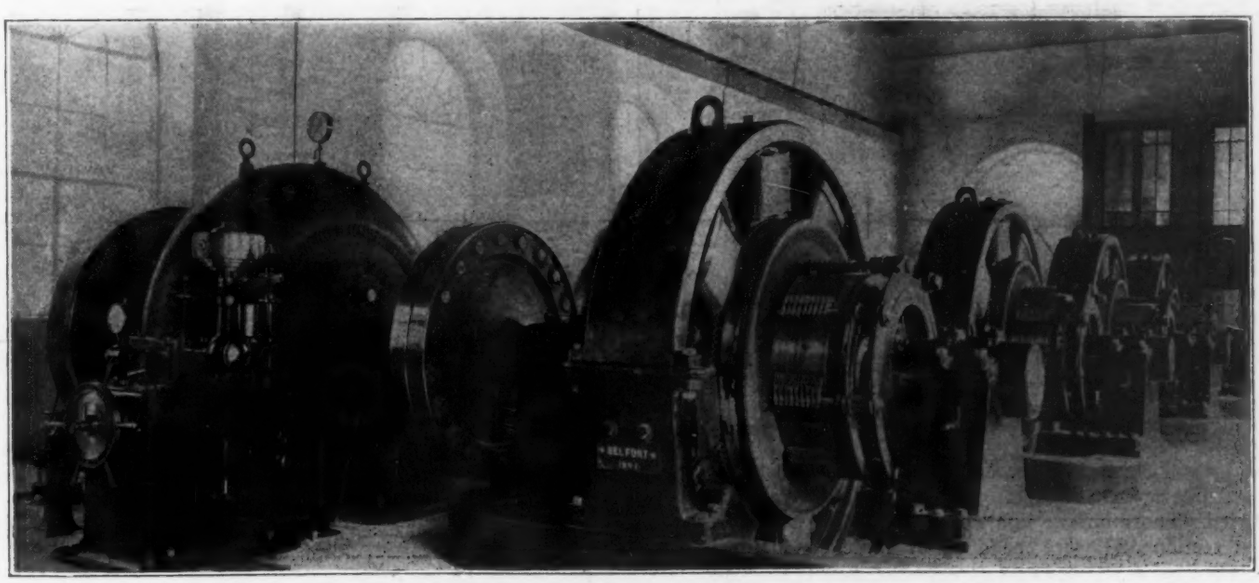


FIG. 1—INTERIOR OF TURBINE PLANT AT LA CASSAGNE

poles, which have been impregnated with copper sulphate and are spaced from 115 ft. to 140 ft. apart. Two cross-arms of creosoted oak are used, fitted with large porcelain pin-type insulators. In the tunnels, of which there are eighteen, having a total length of 7800 ft., two underground cables of three wires each are mounted along the vaulting

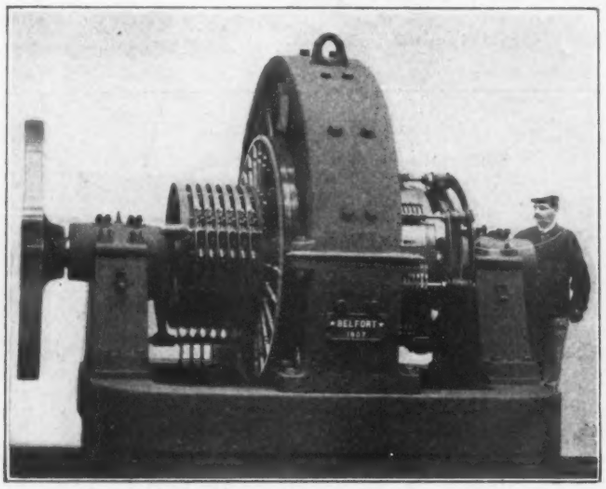


FIG. 2—DOUBLE-CURRENT SIX-PHASE GENERATOR IN STATION AT LA CASSAGNE

and are protected at each end by lightning arresters. A junction box is provided for connecting the cables to the overhead lines.

Between the main station and the Villefranche junction

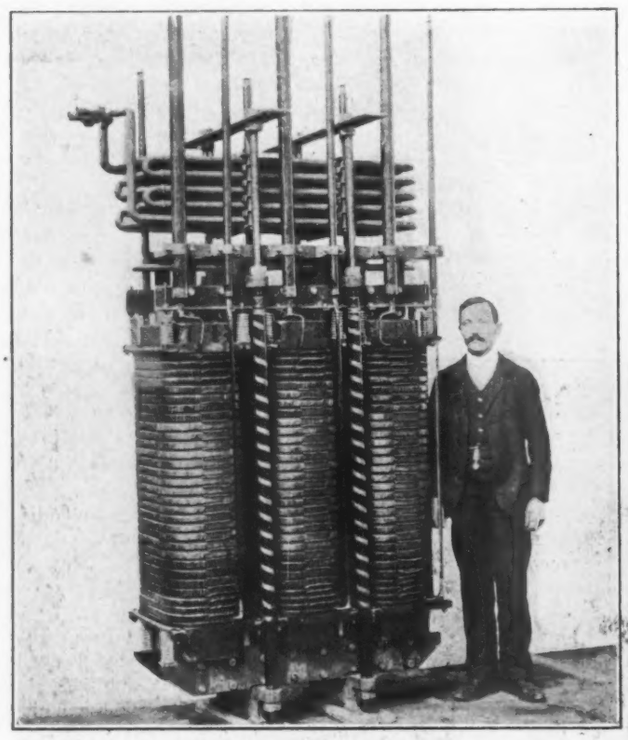


FIG. 3—TRANSFORMER DETAIL

a special construction was used. It consisted of concrete poles carrying aluminum cables, of which two types were tried. Those on one line were 30 sq. mm (No. 2 B. & S.) in section and were made up of three conductors, while on the other line a single stranded conductor of 70 sq. mm (No. 00 B. & S.) was used.

The passenger and freight cars which are used on this line are mounted on double-bogie trucks, and the electrical equipment is the same for each. Each passenger car is fitted with a motorman's cab at each end, a first-class compartment with eight seats, a second-class compartment with thirty-two seats, and a baggage compartment. The freight

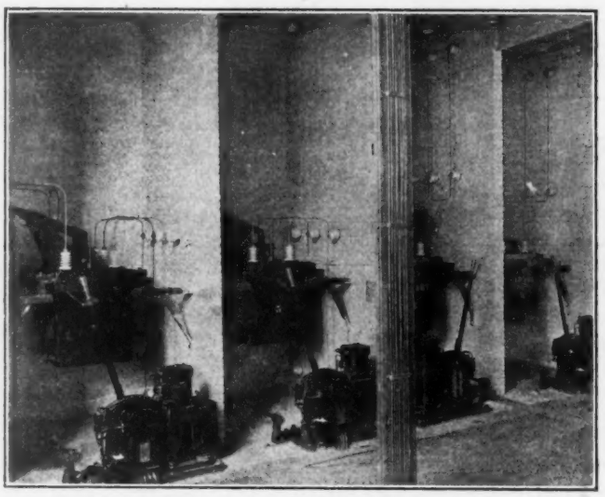


FIG. 4—HIGH-TENSION SWITCHING APPARATUS IN 20,000-VOLT CIRCUIT

cars have a clear floor space with a motorman's position at each end. The motor equipment of each car consists of four 50-hp, 400-volt motors using a gear reduction of 1 to 4.3. The two motors of each truck are permanently

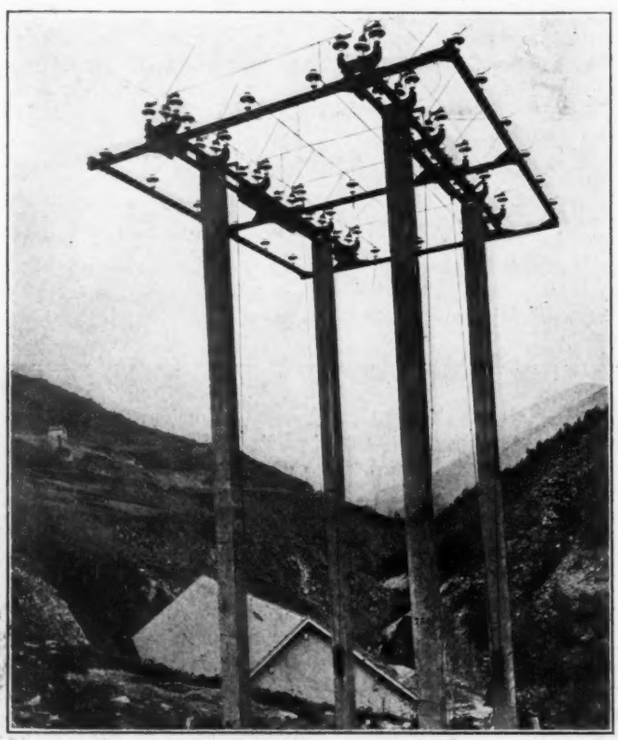


FIG. 5—CONCRETE POLES AT SECTION POINT ON LINE

connected in series so that they may operate at from 800 volts to 850 volts. All cars are equipped with the Sprague multiple-unit control in order to facilitate the handling of trains. Use is made of three braking systems, to avoid trouble on the many steep grades encountered. The main system is the ordinary Westinghouse air brake of the

"straight-air" type. The controller is provided with three extra points for connecting the motor across a resistor carried under the car, and this type of brake is used on steep down grades. In addition to these two systems hand brakes are provided for use in any possible emergency that may arise.

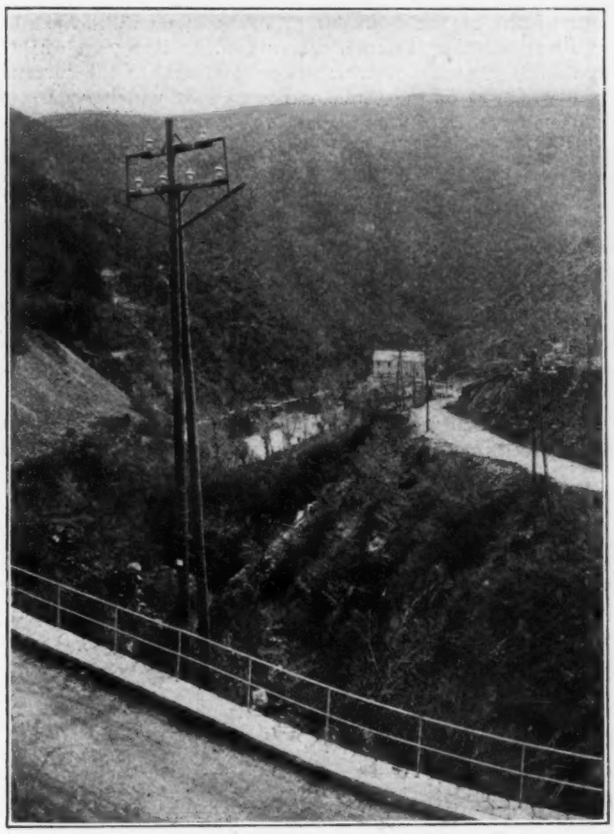


FIG. 6—POLE-LINE CONSTRUCTION FOR 20,000-VOLT CIRCUITS

The rolling stock of the railway, as well as the electrical equipment of the main plant and that of the substations, was furnished by the Société Alsacienne de Constructions Mécaniques, Belfort, France.

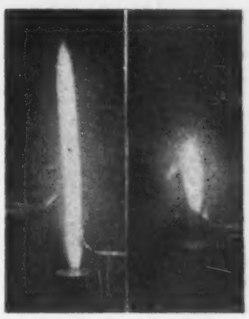
The Coking of Coal at Low Temperatures

The subject of coking of coal at low temperatures is treated in Bulletin No. 60, which was issued by the Engineering Experiment Station at the University of Illinois. This bulletin was prepared by Messrs. S. W. Pau and H. L. Olin and contains an account of their experiments along this line and the results which they have been able to obtain. It was found that Illinois coals could be coked at a temperature approximately 400 deg. or 450 deg. C. The by-products consist of (1) gases of high candle-power and specific heat value and (2) oils containing the minimum amount of tar and free carbon and which are suitable for carbureting water gas and other specific uses. The coke residue has special characteristics which seem to make it of value as a concentrated fuel, capable of combustion without the formation of smoke and suitable for storing without the possibility of spontaneous combustion. The paper states that certain facts have been developed concerning the principles involved in the formation of coke which may open the way to the production of a kind of coke of such texture and strength as to make it acceptable for uses that are not now possible with the coke that is made from similar coal according to present methods.

The Acetylene-Electric Flame

By C. F. Lorenz

That flames exhibit certain peculiarities under electrical influences has been known since the earliest days of electrical science, and their behavior in this respect has been the subject of a very large number of investigations. These cover the following classes of phenomena: the conduction of currents of electricity by flames, the yielding of currents by a flame when wires leading to a galvanometer are unsymmetrically placed in it; the distortions that a flame may be made to undergo when brought into various relations with charged bodies. The more modern work has been confined to the first of these subjects, and in particular to the conduction of currents that are very small, usually of the order of several micro-amperes, both in flames modified in their conducting properties by the addition of various salts and in so-called "pure flames," that is, flames not containing salt vapors. The experiments described in the present article relate to the more old-fashioned topic of electrically caused flame distortions, together with an associated phenomenon, namely, an increase of luminosity that may be obtained by sending current through carbon-containing flames. Attention has already been called to the latter effect by the writer,[1] the first experiments having been performed with alternating current, with which the requisite high voltage is readily obtained by means of a transformer. Opportunity has since occurred of extending these experiments in the physical laboratory of the Johns Hopkins University, where a source of direct current at 4000 volts or 5000 volts became available.



FIGS. 1 AND 2—SHORTENING OF FLAME DUE TO HEAVY CURRENT

This source consisted of a set of five small generators having their armatures in series. Besides facilitating the electrical measurements, direct current has the important advantage that its use avoids the confusion of the effects at the two electrodes which necessarily occurs with alternating current.

Deflection of a Flame Toward a Cathode

The results obtained by the early investigators who examined the distortions which a flame undergoes in an electric field are somewhat complicated. The most prominent phenomenon observed was an apparent attraction of at least part of the flame by a negatively charged body. Various hypotheses have been proposed to account for this—for example, one of the possibilities suggested by J. J. Thomson[2] is that perhaps "corpuscles" are given off by the molecules of the hot gases, leaving the latter positively charged. The following experiment suggests an explanation entirely different from this and from any that has heretofore been advanced.

Description of the Phenomenon

The flame used was a simple cylindrical jet burning from a pin-hole burner. The gas used was acetylene, though this particular phenomenon can be observed just as well with coal gas or hydrogen. An important part of a simple cylindrical flame is the invisible mantle of vapor which envelops the visible part and extends far up above it, and which shows when a shadow of the flame is thrown upon a screen by means of a beam of sunlight or arc light. Such a shadow picture was formed, and by watching the latter the electrodes could have given them any desired position with respect to the mantle. Instead of using a static ma-

[1] *Phys. Zeit.*, Vol. 8, page 20; 1907.
[2] "Conduction of Electricity Through Gases," Chapter IX.

chine to charge the conductors brought near the flame, as has been done in the past, use was made of the generators; a high resistance was put in series to prevent a short-circuit in case the terminals were brought too close together.

When the machines are run at 2000 volts or 3000 volts and the negative terminal is brought near the flame—say at a height half-way between the base and the tip—no deflection whatever of the flame is observed, provided everything is well insulated, and this is so even if the negative terminal is brought well within the flame's mantle of hot vapor. On bringing the positive terminal of the machines up on the opposite side, but not touching the invisible mantle, a very slight deflection of the flame toward the cathode is observed. The moment the positive terminal is brought close enough to touch the mantle as observed in the shadow picture the flame is strongly deflected toward the cathode and may even come in contact with it. A galvanometer inserted in the circuit, showing no current so long as the positive terminal is outside the mantle, suddenly indicates a current as soon as the mantle is touched by the electrode. The deflection occurs no matter what part of the mantle is touched by the positive terminal, and occurs even if the latter is placed alongside of the negative terminal only a few millimeters from it. If the phenomenon were purely an electrostatic one, the effects of the two electrodes would

FIG. 3—DEFLECTION OF FLAME TOWARD A CATHODE

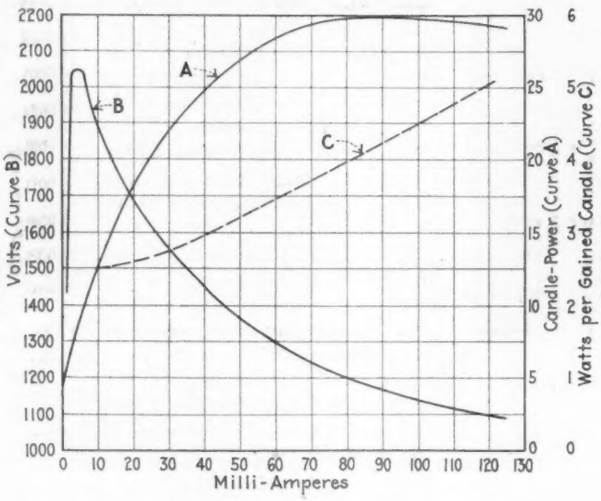


FIG. 4—CANDLE-POWER-CURRENT, CURRENT-VOLTAGE AND CURRENT-WATTS-PER-GAINED-CANDLE-POWER RELATIONS

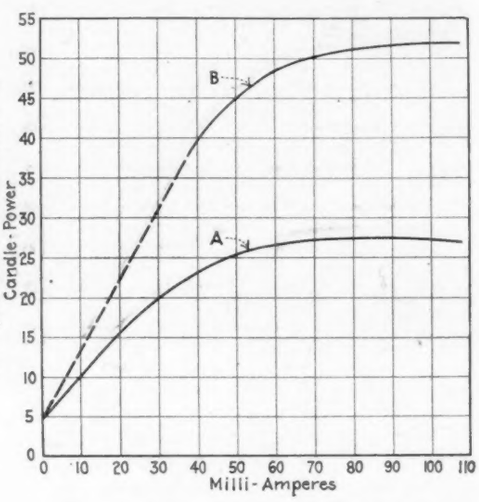


FIG. 5—CANDLE-POWER-CURRENT RELATIONS AT DIFFERENT GAS PRESSURES

produced by combustion or temperature. In the light of what is now known in regard to the nature of conduction of electricity through gases the explanation seems clear. We have only to remember the high resistance at a cathode owing to the scarcity of ions at the surface of the latter, this scarcity itself being caused by the fact that the solid electrode does not furnish carriers to replace those swept out of the region adjacent to the cathode in the act of conduction. For minute currents there is a fall of potential at the cathode which is proportional to the current, and which is of the same nature as that which occurs at those electrodes of a mercury-arc rectifier which are anodes for the passed half-waves but cathodes for the reverse half-waves. There is, similarly, a scarcity of positive carriers at the surface of the anode in the flame, but the "cathode drop" is much greater than the "anode drop" because of the greater mobility of the negative carriers. On account of this high cathode resistance the flame is prevented from acquiring the potential of the cathode, but it does take on approximately the potential of the positive electrode. Consequently attraction occurs between the cathode and the flame-gas near it, causing motion of the latter along the cathode and a consequent local diminution of pneumatic pressure which results in a deflection of flame and mantle. The fact that for minute currents the drop at the cathode in this case have to neutralize each other. As the positive terminal is brought closer and closer to the negative one the deflection of the flame is increased until the electrode distance is so short that a visible discharge forms, when the flame resumes its normal position. As soon as a visible discharge appears only a minute spot on the cathode forms the base of the discharge, while in the conduction of a very small current the whole cathode surface immersed in the mantle presumably takes part. By observing the shadow picture it is seen that the deflection of the flame proper is accompanied by a movement of the mantle in the same sense. and also that the flame gases seem to move along the negative wire away from the tip. The deflection effect can be imitated perfectly by sucking through a glass tube the open end of which replaces the cathode. It is surprising how strongly the air must be drawn through the tube to give the same result as that produced electrically.

Explanation of the Deflection

From the observations just described it seems evident that the deflection effect depends in some way upon the flow of current, instead of being a purely electrostatic interaction between a negatively charged body and charges is proportional to the current agrees with the observation that the deflection increases as the anode is brought closer and closer to the cathode. The observed ceasing of the deflection as soon as a visible discharge appears at a spot on the cathode is to be expected since the copious supply of ions at the locally heated spot would end the existence of the high cathode resistance.

Shortening of a Flame Under Heavy Discharge

Another very striking distortion of a simple cylindrical flame is a shortening which occurs when it is traversed by currents larger than those which give the deflection toward the cathode. As soon as the current is made great enough to give a visible discharge a shortening is observable; as the current is increased the flame continues to shorten down to say one-half or one-third its original length. The effect is shown by the halftones Figs. 1 and 2, the former being an uninfluenced acetylene flame and the latter the same flame when traversed by a current of 1/10 amp. This shortening is doubtless to be ascribed to the increased rate at which combustion takes place when the temperature of the flame is raised by the discharge—the size of a flame being always determined by the condi-

tion that its surface must be just great enough for the rate of combustion of the gas to equal the rate of supply.

INCREASE OF LUMINOSITY

The light emitted by a flame, luminous owing to the presence of free carbon, can be increased both in quantity and whiteness by the passage through the flame of an arc-like discharge such as that given by an induction coil when the primary is supplied with alternating current. If the flame is one that has but little "stiffness," such as any flame burning from a wick or a gas flame operating at low pressure, then the flame will be so much distorted by the discharge that it would be hopeless to try to make any measurements. On the other hand, if a cylindrical gas jet issues at considerable pressure from a burner of fine bore it will burn quite steadily even while the discharge is passing through it, provided there be a suitable disposition of the electrodes, as described below.

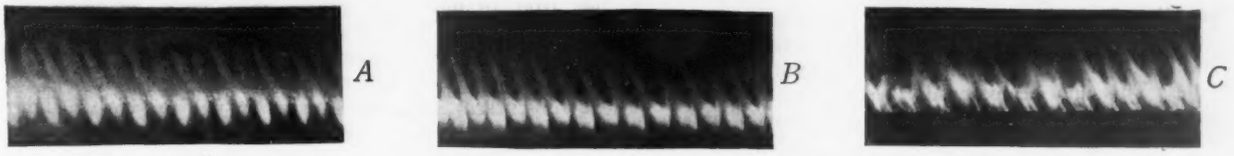


FIG. 6—PHOTOGRAPHIC REPRODUCTIONS OF FLAME SUPPLIED WITH ALTERNATING CURRENT

CHOICE OF GAS

When illuminating gas is used the increase of luminosity owing to the discharge, though easily perceptible, is not very striking, but in the case of a gas containing a greater percentage of carbon the increase may amount to several times the original value. The most suitable gas is acetylene, C_2H_2, on account of its high carbon content together with its high temperature, the latter making it capable of being burned in a sufficiently "stiff" flame. The vapor of benzene, C_6H_6, has the same percentage of carbon, and its use would be very convenient, but it cannot be burned under sufficient pressure. The velocity of the issuing jet, if great enough to give the required stiffness, is greater than the velocity with which the ignition is propagated toward the burner, this velocity being rather small on account of the comparatively low temperature of the benzene flame. The same is true of the vapors of other carbon compounds which are liquid at ordinary temperatures and capable of being readily vaporized, such as amyl-acetate, pentane, xylene, etc. These were vaporized in a small closed brass vessel into which the thimble-like burner tube was directly soldered, the vessel being electrically heated so that the flame could be readily controlled by a rheostat. To use such fuels at all for the purpose in question it is necessary to start the discharge with the flame burning low; on then increasing the pressure, the flame, though no longer reaching down to the burner, continues to burn between and above the electrodes, where the temperature is raised by the discharge. To the benzene flame there is also the objection that it is very smoky. With acetylene none of these troubles exist. All the measurements of candle-power given below refer to this gas.

DEPOSIT OF SOOT

In order to have a flame that contains suspended carbon burn satisfactorily while carrying a current it is necessary to avoid the deposit of soot upon the electrodes. If an electrode touches the luminous part of the flame a surprisingly large amount of soot will build itself upon it, sometimes forming a tree-like growth that may reach from one electrode to the other. For this reason the burner cannot be used for one electrode, as the soot would interfere with the flow of gas. Heating the electrodes is ineffectual in preventing this deposit of soot. The deposit is, doubtless, due to electrostatic attraction. This would account for the tree-like character of the deposit, as the electric force would always be strongest at the tips of the branches. The trouble from the soot may be entirely avoided by keeping the electrodes out of the luminous part of the flame, having it only in the invisible mantle of hot gases surrounding the flame. The best arrangement is to have one electrode near the base of the flame and the other on the other side about one-third or one-half way up to the tip. In spite of this unsymmetrical arrangement the flame does not lose its appearance of symmetry. There is not merely an arc through the flame from one electrode to the other, but the whole flame seems to take part in the discharge. If the current is very strong the arc can be traced; it is blown by the flame past the upper electrode and curves down to meet the electrode. The steadiness obtainable depends very much on the proper shape and adjustment of the electrodes as the base of the discharge has a tendency to shift about on the electrode. It is best to give the electrodes, consisting of bluntly pointed wires, an upward slant at the end.

FIG. 7—PHOTOGRAPHIC REPRODUCTIONS OF FLAME WHEN SHUNTED BY INDUCTANCE AND CAPACITY

ELECTRICAL AND PHOTOMETRIC MEASUREMENTS

It seemed worth while to obtain some quantitative data in regard to the conduction of current by the flame and in regard to the candle-power changes, and to this end apparatus was arranged so that sets of simultaneous readings of current, difference of potential between electrodes, and candle-power could be made. The current through the flame was read on a Weston instrument and difference of potential between flame electrodes on a Kelvin electrostatic voltmeter. In series with the flame it was, of course, necessary to have a certain amount of resistance to preserve the equilibrium. For the photometric measurements a simple flicker photometer was used, because the variation in whiteness of the flame with variation of current made it impossible to make reliable settings with a Lummer-Brodhun or Bunsen photometer. In all cases given the horizontal candle-power of the flame was measured in terms of the candle-power of a standardized incandescent lamp.

RELATION BETWEEN CANDLE-POWER AND CURRENT AND BETWEEN CURRENT AND VOLTAGE

The curves in Fig. 4 show the result of a set of such readings. In this run the voltage at the generators' terminals was left unchanged at 3300 volts, the current being varied by means of the series resistance. The flame height

was 40 mm, the gas-pressure at the burners 67 mm of water, and the rate of flow of gas was given by a rate-meter as 0.23 cu. ft. per hour. The vertical distance between the electrodes, which were made of copper, was 11 mm.

It will be observed that there is a gradual increase of candle-power with current up to a limiting value, which in the present example is approximately five times that of the uninfluenced flame. With very large currents there is a slight falling off of candle-power. The points near the beginning of the two curves show that the increase of candle-power begins while the discharge is still in the "glimm-strom" stage, before a true arc is formed. The dotted line shows the variation of the "specific consumption" in watts per candle as the current is varied, the lowest value on the curve corresponding to 2.5 watts per gained candle. This may be materially reduced by operating the flame at a lower gas-pressure, for the reason given in the next paragraph.

Comparison of Operation at Different Gas Pressures in Regard to Highest Candle-Powers Attainable

It seemed probable that with burners of different bore, operated respectively at such pressures that the rate of flow of gas was the same for all, the candle-power attainable would be the same for all, but the following experiment shows that this is by no means the case. Candle-powers and currents were measured for two burners in succession, leaving the electrodes undisturbed but changing the burners. With the aid of a simple gas-flow indicator of the kind described by Tufts,[3] the rate of flow for the two burners was made the same, this being about 0.25 cu. ft. per hour. The results are shown in the curves given in Fig. 5. It is seen that, though for the flame without the discharge the candle-power is approximately the same for both pressures, the candle-power attained with current is greater the less the pressure needed to give the same rate of flow. Therefore it is advantageous, when using a current-carrying acetylene flame as a source of light, to choose a jet that will give a flame only just stiff enough not to be distorted by the discharge. The explanation may lie in the fact that the greater the velocity of the jet the more air is dragged along by the flame, and consequently the more rapid the combustion and thus the less the amount of free carbon present.

Comparison of Candle-Power Attainable with Direct Current and Alternating Current

From the fact that with alternating current the discharge is practically zero during a considerable fraction of the period (since the difference of potential at the terminals has to rise to a certain value before the discharge begins), combined with the fact that the highest candle-power attainable is limited no matter how heavy the discharge, one would expect that the value to which the candle-power could be pushed would be higher with direct current than with alternating current. This is shown to be the case by the following comparison; the direct and alternating currents were each made great enough to give the limiting value of the candle-power: Flame without current, 5.3 cp; flame with alternating current, 28.8 cp; flame with direct current, 44.2 cp.

[3] F. L. Tufts, *Phys. Rev.*, Vol. XXII, page 193; 1906.

Effect of Material of Electrodes

Using direct current, it is only the cathode that is heated to any extent by a current sufficient to give the limiting value of the candle-power. A platinum cathode will become white hot and melt; if coated with calcium-oxide it will remain comparatively cool (only red hot) until the oxide is all volatilized, which soon occurs if it is only a thin coating. A piece of metallic calcium serves very well as a cathode, the base of the discharge then being a minute spot on the oxidized surface. To determine the effect of the material of the cathode upon the candle-power attainable a direct comparison was made of the following: copper, iron, titanium, magnesium, manganese, cadmium, silver, platinum, calcium and carbon. It was found that except for slight discrepancies caused by the position of the cathode, the same photometer reading gave a balance for all, the current being made great enough to give the limiting value of the candle-power.

Photographs on a Moving Plate

The increase of luminosity caused by the discharge is shown by photographs taken on a moving plate when the flame is operated on alternating or intermittent current. In Fig. 6, page 501, *A* and *B* show the result of supplying the flame with ordinary 60-cycle alternating current, the current strengths being 3 and 10 centi-amperes respectively. The discharge begins and ceases each time the potential difference rises and falls to certain critical values, and in that part of the period during which the potential difference lies below this value the flame regains nearly its original height. In *C* is shown the effect of shunting the flame (supplied with alternating current) with a condenser; the discharge is then irregular and emits a crackling sound,

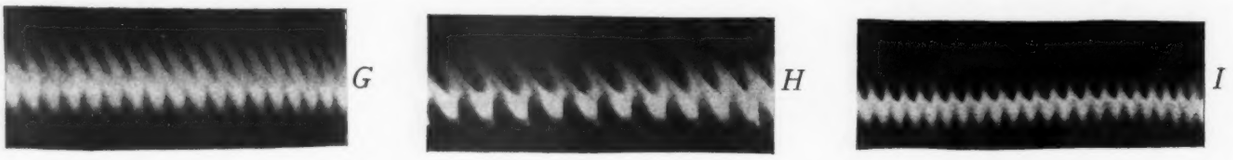


FIG. 8—PHOTOGRAPHIC REPRODUCTIONS OF FLAME UNDER ACTION OF DIRECT CURRENT

the same as with a much higher difference of potential in air. If the flame is shunted by inductance and capacity in series, the discharge is much more regular, as is shown by *D* and *E* in Fig. 7.

The remaining photographs show the results obtained with direct-current supply. In *F* the capacity was large compared with the inductance and the note emitted not agreeable. Increasing the inductance gives the effects in Fig. 8 (*G* and *H*), and *I* was taken while the cathode (upper electrode) was of calcium. In the last three cases the note emitted was of considerable purity. By suitable adjustment of induction and capacity it was easy to vary the frequency of discharge from values too low to give an audible note up to values that were too high.

Color of the Flame

The high temperature to which the carbon is raised by the discharge makes the light emitted much whiter than that of a flame without discharge, as can be most readily shown by allowing the two sources to cast adjacent shadows of a pencil on a white screen. The shadow receiving light only from the current-carrying flame appears blue compared with the other. On the other hand, the light is yellower than that from the crater of a carbon arc.

The Current-Carrying Acetylene Flame as an Illuminant

This combination of acetylene flame with small-current, high-potential arc is worth some attention as an illuminant, though the high voltage required and the rather high spe-

cific consumption detract from its interest in this respect. The "radiant efficiency" is large, owing to the high temperature of the carbon particles, but the specific consumption is high on account of a high conduction-convection loss. The combination may from one standpoint be looked upon as a carbon-incandescent lamp having the filament material continually renewed, and from another as a small-unit flaming arc in which the electrodes are not consumed and the luminous material is the carbon supplied by the acetylene.

ITS USE IN PHOTOGRAPHY AND SPECTROSCOPY

Owing to the high temperature attained by the carbon particles the current-carrying acetylene flame compares with other continuous-spectrum illuminants (with the exception of the arc) much more favorably in photographic efficiency than in candles-per-watt output. It may also be useful in spectroscopic work as a source of radiation when strength in the violet and ultra-violet of a continuous spectrum is needed. Although its intrinsic brilliancy is less than that of the crater of a carbon arc, it has the advantage that it presents a larger radiating area than the hottest part of the arc, which is only a spot, and also of running indefinitely without attention. Spectral reference lines can be conveniently obtained by shunting the flame with a condenser during a part of the exposure when lines corresponding to the material of the electrode are superposed on the continuous spectrum.

The writer takes pleasure in acknowledging the helpful suggestions received from Prof. J. S. Ames during the course of these experiments.

Smallest Japanese Generating Station

By M. KAWARA

That Japan may not be far behind other parts of the world in the utilization of electricity can be inferred from the tiny power house illustrated herewith having an equipment rated at only 1.5 kw. The fact is that many streams in the country are harnessed to supply energy for electric lamps to take the place of oil lamps and wooden torches in villages scattered along their routes. The plant here shown is located in the village of Tamagawa, about 60 miles west of Tokyo. It is owned and operated by one of the villagers for his house lighting and also for fan motors in the summer and radiators in the winter. The wooden house in the front is the generating station, in which is installed the 1.5-kw direct-current generator designed for

SMALL GENERATING STATION IN TAMAGAWA, JAPAN

100 volts and 15 amp, driven by a 2-hp waterwheel having a runner diameter of 13 in. and operating under a water head of only 9 ft. The thatched shack at the rear is a rice mill operated from the same source of water.

The transmission line is 1000 ft. long and is supported on five poles. For lightning protection use is made of a telephone arrester. Arrangement is made for regulating the voltage from the end of the line by means of a field rheostat.

The plant has been in operation for over two years and has given no trouble whatsoever thus far. The total cost of the plant including the line was a little less than $500. The owner states that the lighting service is much more economical, convenient and safe than that obtainable from oil lamps.

Midwinter Convention, A. I. E. E.

The preceding issue contained a report of the midwinter convention of the American Institute of Electrical Engineers, held at New York Feb. 26 to 28, including abstracts of the papers and discussions presented at the morning and afternoon sessions of the first day. The meeting of Wednesday evening was given over to the presentation and discussion of fourteen papers on the subjects of heating, heat measurements and rating by heat. Abstracts of these papers and of those on the following days now appear, together with an account of the general discussion they provoked.

INTERNAL HEATING OF STATOR COILS

Mr. R. B. Williamson's paper takes up the problem of the internal heating of the coils of alternator stators, espe-

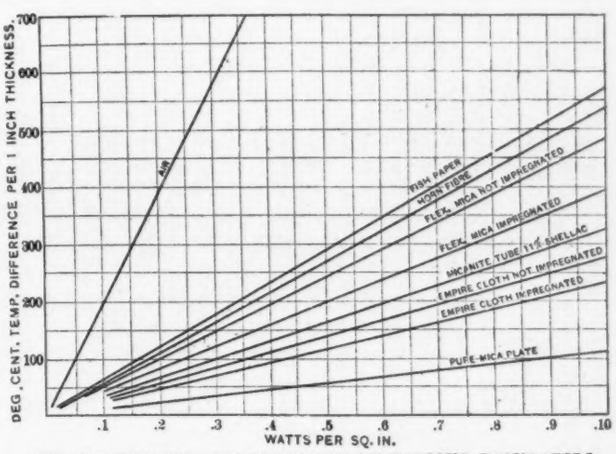


FIG. 1—RELATIVE TRANSMISSION OF VARIOUS INSULATORS

cially long-core machines in which the direct heat path is long. Accordingly, much of the heat transfer must then occur through the insulation and iron, so that the probable temperature difference between the two sides of the insulation should be known. The paper concludes with the report of some tests made to determine this difference. Tables of thermal-conductivity coefficients are also included, and the method of calculating temperature gradient is outlined. Fig. 1 shows the heat transmission of various insulators.

TEMPERATURE MEASUREMENTS IN ROTATING MACHINES

In discussing the features of standard test methods, Messrs. L. W. Chubb, E. I. Chute and W. A. Oetting point out the indefiniteness of certain of the present Standardization Rules which result in measurements of iron and copper temperatures, instead of insulation temperature, although it is the latter, of course, that is of importance. Thermocouple and exploring-coil methods are discussed, together with their limitations, and a convenient arrangement of a thermocouple with a potentiometer is described (see Fig. 2, page 504). Exploring coils are expensive and laborious to use, thermocouples being much preferable. For internal temperatures in revolving parts, one should await shut-down and use thermocouples, since brush con-

tacts and collector rings are unreliable. A thermocouple can often be used to take temperatures quickly that would be affected by continued presence of a thermometer. Full-field excitation should be used in bringing machines to rest quickly after heat runs, thus maintaining their temperatures.

Temperature Measurements of Alternators and Motors

In discussing methods of obtaining room temperatures and internal temperatures in generators and motors, the authors, Messrs. H. G. Reist and T. S. Eden, recommend standard putty coverings for thermometer bulbs. Their own experiments show that such a form of covering will indicate higher temperatures than coverings of cotton waste, felt, wool, etc., besides being convenient to handle and of such compact form that the covering does not impede natural circulation over a large area of the surface under examination. Resistance measurements to determine internal temperatures often disagree widely, the cold reading usually being the principal source of error. Such resistance methods should be limited to revolving parts, for they become particularly erroneous applied to stators, etc. For room temperature readings a metal cylinder inclosing

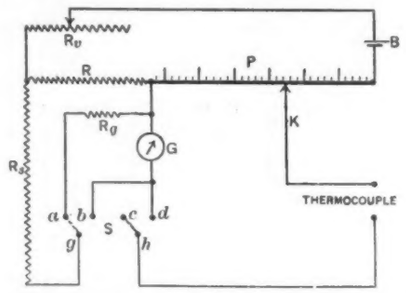


FIG. 2—POTENTIOMETER CONNECTION FOR THERMOCOUPLE

the thermometer bulb is recommended. The actual method of determination, however, should depend on the kind of ventilation used.

Thermocouples and Resistance Coils for Measuring Local Temperatures

The paper by J. A. Capp and L. T. Robinson discusses devices for measuring temperatures in electrical machines and their sources of error, especially the limitations of mercury and alcohol thermometers, thermocouples and resistance coils. Fluid thermometers generally measure only surface temperatures. Rotating parts must therefore be measured after they come to rest, introducing large chances of error due to changes of temperature, slow indication of thermometers, small bulb contact, emergent steam, etc. Where internal coils of fine copper are used, highly accurate measurements are possible, as the coefficient of temperature of the wire may be accurately known. The extent of the coil determines the extent to which the measurement is local. For accurate determinations, some sort of bridge is required. The thermocouple is the most accurate device for measuring local temperatures, as the emf generated is a function of the difference in temperature between the junction of the wires of the couple and their free ends, and the temperature of the free ends can be accurately controlled. Thermocouples require precision meters for reading their indications, and potentiometer arrangements may be applied to obtain any desired degree of accuracy. Ordinary thermometry is the simplest, quickest and least accurate method of temperature measurement and usually applies only to surface conditions. The choice between the electrical methods is determined by the ease of application. The thermocouple will give the most rapid indications, although the resistance method is almost as rapid if the coil is of right proportions and is intimately applied to the parts whose temperature is to be measured.

Determining Temperatures of Transformers and Cooling Medium

Messrs. S. E. Johannesen and G. W. Wade, the authors, call attention to the errors resulting from variation in air temperatures during a heat run on a self-cooled, oil-immersed transformer, because of the tardiness with which the large mass follows the temperature changes in the sur-

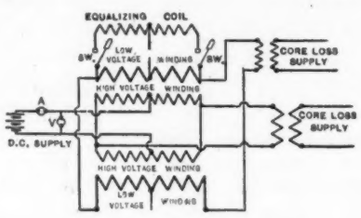


FIG. 3—METHOD OF MEASURING RESISTANCE WITHOUT CUTTING OFF LOAD

rounding medium. The effective temperature of the cooling medium is really that of a duplicate transformer under similar conditions and without load and such an actual value should be used in calculating rises. The paper recites actual tests showing the advantages of using such an idle transformer for comparison of temperatures and recommends that this form of test be prescribed in the rules. Fig. 3 illustrates a method of measuring resistance.

Determining Transformer Temperatures

Each part of a piece of electrical apparatus should be ventilated in accordance with its individual requirements, as pointed out by Messrs. W. M. McConahey and C. Fortesque, in their discussion of methods of measuring the temperature of transformers. Tests of cooling efficiency are reproduced and standard methods for loading transformers described. Theoretical proof of the method of alternate open-circuit and short-circuit testing is given. This scheme is useful in saving energy when a single transformer is on test. Investigations using this method with both self-cooled and water-cooled transformers gave results which agreed closely with those obtained with standard tests. Balanced loading is shown in Fig. 4.

Correction of Transformer Temperatures for Room Conditions

Mr. C. Fortesque first assumes a body of copper and, considering that loss of heat takes place only by convection, computes its corrected temperature rise for any arbitrary room temperature. Next similar formulas are derived for

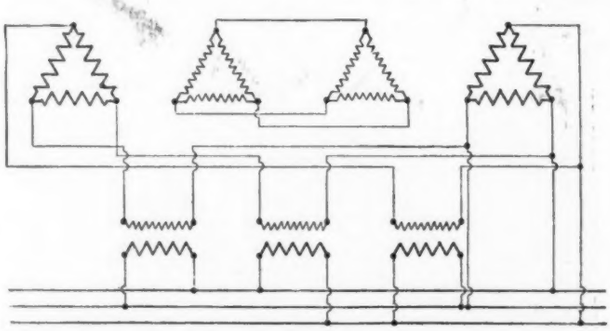


FIG. 4—THREE-PHASE BALANCED LOADING OF TRANSFORMERS

bodies of both iron and copper. When the iron and copper losses are taken into account it is found that the difference between the observed temperature rise and that for the standard room temperature is, as a rule, negligible. The average temperature rise of the oil is proportional to the total heat dissipated if the convection currents in the oil were constant in flow. But with rise of temperature the

oil flows faster and its viscosity also decreases so that the correction factor assumed will be too great. If the increased radiation is also included, the factor may reduce to zero, even sometimes becoming negative.

TEMPERATURE RISE OF STATIONARY INDUCTION APPARATUS

Messrs. J. J. Frank and W. O. Dwyer suggest directions in which revision is needed in applying correction for the effects of temperature, atmospheric pressure, humidity, etc., of the cooling medium, in arriving at the temperature rise of stationary induction apparatus. It was expected that humidity might have considerable effect, but except for fog-laden air, the possible effect is very small, as shown by a theoretical study. Actual tests, reported in the second part of the paper, check these observations. Apparatus should be tested, it is recommended, under conditions approaching, as nearly as possible, those under which it is to operate. Where these requirements cannot be maintained, suggestions are given for applying correction factors for room temperature and atmospheric pressure.

EFFECT OF ROOM TEMPERATURE ON TEMPERATURE RISE OF MACHINES

Messrs. Maxwell W. Day and R. A. Beekman report the results of special tests on motors and generators to determine the effect of room temperature on machine temperature rise. In part of these experiments the room temperature could be varied at will. A general tendency was noted toward higher rise at the cold-room temperature, but the inconsistency of other results makes an accurate rule or statement inadvisable. However, from the curves and data presented in the paper, it is concluded that the present correction rule is wrong and should be corrected. The tests revealed the difficulty of formulating a rule to include all types of machines or even all parts of the same machine. Ultimate temperature reached is of greater importance than the rise noted, although further tests are desirable to fix a general statement to apply to temperature corrections.

EFFECT OF TEMPERATURE, PRESSURE AND HUMIDITY ON TEMPERATURE RISE

Besides the rise in copper resistance with temperature, the authors, Messrs. C. E. Skinner, L. W. Chubb and Phillips Thomas, point out that other factors affected are the variation in iron loss with temperature; increased iron resistance, reducing eddy-current losses, variation in quantity of heat radiated at different temperatures, change in viscosity of cooling medium, change in thermal conductivity of air, variation in barometric pressure, change due to humidity, variation in windage and brush and bearing friction, etc. The tests which the authors report show that within commercial limits the temperature rise is independent of air temperature, provided nearby objects are at air temperature. In conclusion the authors recommend that, contrary to the provision specified by the Standardization Rules, no correction be made for variation in air temperatures with the usual testing limits. As above enumerated, some of the variables are positive, some negative, and others either negative or positive depending upon contemporary operating conditions.

TEMPERATURE RISE AND ATMOSPHERIC CONDITIONS

In reporting their laboratory investigation of temperature rise as a function of pressure, temperature and humidity, Messrs. C. R. Blanchard and C. T. Anderson describe in detail the apparatus and methods used, although expressing regret for the incompleteness of the observations due to unforeseen difficulties. The data collected include values for temperature rise with varying air pressure, humidity and temperature. Curves are given showing the relation of temperature rise to watts input, pressure, temperature, etc. The authors express confidence in the results thus far obtained, although they plan to report later on a more thorough and careful investigation now being made.

LAWS OF HEAT TRANSMISSION

Mr. Irving Langmuir points out that the laws of heat transmission in electrical machinery depend upon three modes of thermal transfer—conduction, convection and radiation. A useful collection of reliable data on thermal conductivities and resistivities of various metals and materials is included under the discussion of the first subject, heat conduction. These data are also supplemented by figures on emissivities of various bodies for use in calculating radiation losses by the Stefan Boltzman fourth-power law. Experimental results, it is said, confirm the film theory of convection, which affords an easy analysis of the changes occurring with temperature and pressure. Viscosity is one of a number of important factors in the convection of heat in liquids. Radiation and convection are usually about equally effective in carrying heat away from a surface, but a distinction must be carefully drawn when the walls of the room are of a different temperature from the air.

CURRENT RATING OF ELECTRIC CABLES

Messrs. R. W. Atkinson and H. W. Fisher point out that the rating of an electric cable depends entirely upon its allowable heating, and this in turn is limited more by the external conditions than by particular features of the cable itself. Variability in these external conditions may reduce the rating to one-half, one-third or even a smaller fraction of its normal value. The paper discussess limiting temperatures, for both long-hour and intermittent operation, and presents methods of calculating temperature rise of cables in free air. Tables are given showing overload carrying capacities of various cables and the time necessary for the cable to reach 90 per cent of its final temperature, etc. It will require 50 per cent longer to attain 97 per cent of final temperature and 50 per cent less time to attain 68 per cent of final temperature. For nearly all conditions the carrying capacity of stranded cables varies as the 1.3 power of the diameter of the equivalent solid section.

THE HEATING OF CABLES CARRYING CURRENT

In this paper Mr. Saul Dushman points out that the carrying capacity of a cable may be computed with fair accuracy from observed data on the thermal resistivity of the insulation and the surface. In his experiments the following heat-transmission values (in degrees Centigrade per watt per inch cube) have been found: Rubber and cotton braid cover, 250; varnished cambric and cotton braid, 400; varnished cambric, lead-covered cables, 300. For surface resistivities (degrees Centigrade per watt per square inch): painted-steel braided armor, 100; cotton covering, 120; lead, ordinary, 190; lead, dull black, 140. Results show that the effect on carrying capacity of surface resistance is much greater in general than the internal thermal resistance of the insulation. The surface losses thus become of great importance in determining cable-carrying capacities.

Discussion on Heating and Heat Measurements.

In a written discussion Mr. C. P. Randolph pointed out the complexity of calculations of temperature in stator coils and the large effects which slight differences in air-film thickness may introduce. Tests of a machine even before and after painting may show discrepancies, due to the higher heat emissivity of the painted surfaces.

Mr. E. D. Edmonston reported some effects observed in cable burn-outs at Baltimore where succeeding breakdowns in adjacent cables at the same point were caused by globules of water distilled from the paper insulation at the time of the first break-down. Mr. Edmonston expressed hope that a more uniform set of cable specifications might be formulated through agreement of manufacturers and users.

Among those who took part in the oral discussion Wednesday evening were Messrs. C. W. Burrows, C. A. Adams, S. O. Dushman, W. F. Dawson, Leo Schüler,

H. M. Hobart, C. O. Mailloux, C. P. Steinmetz, W. A. Durgin, B. G. Lamme, M. Leeds, L. W. Chubb, L. T. Robinson, R. F. Schuchardt, A. E. Kennelly, James Burke, Robert Landell, F. D. Newbury, Alexander Gray, R. B. Williamson, C. J. Fechheimer, Ralph D. Mershon and S. Haar.

In reply to a question by the German delegate, Mr. Schüler, Mr. Hobart declared his opinion that fog-laden or moist air offers a practical means of reducing the air volume to be circulated for cooling certain electrical machinery. There are, however, he cautioned, several practical details and problems which must be understood and solved before this use of moist air can be successful.

Mr. W. A. Durgin referred to the successful use of temperature or exploring coils on generators of from 5000 to 20,000 kw rating in Chicago. Close record is kept of internal temperatures and advance warning is given of clogging of the slots, indicating when cleaning is necessary.

Mr. L. W. Chubb reported that while nickel is an excellent material for temperature coils from the standpoint of its temperature coefficient, specific resistance, etc., it has the objectionable property of changing its electrical resistance when magnetized. One such exploring coil showed 2 per cent rise in resistance with its turbine field excited.

The "Myriawatt" as a Unit of Boiler Power

Mr. H. G. Stott opened Thursday morning's session with a discussion of the proposed use of the "myriawatt" and the "myriawatt-hour" as ratings of boiler power and performance. The speaker pointed out that the criticism to which this proposed unit has been subject is in general due to a misconception. At the present time the units of boiler power are not only arbitrary but based on many different definitions, including evaporation, heating surface, quantity of steam delivered, etc. It is a happy coincidence, said Mr. Stott, that one boiler horse-power equals 10,000 watts or 10 kw, hence the name "myriawatt." The intention, he said, was not to introduce a new unit, but simply to add a multiple prefix to the familiar unit of power, thus making a convenient measure of the proper order of magnitude, corresponding in application to the kilowatt.

Dr. C. P. Steinmetz called attention to the heterogeneous and incompatible units employed in modern power-plant nomenclature, and the difficulty of making calculations or conversions through the various systems of units employed.

Prof. C. A. Adams pointed out the inconsistency of such present engineering calculations and declared that the average engineer wastes at least one year of his career in struggling with the present system of units.

Dr. A. E. Kennelly said that in Germany the difficulty in getting the mechanical engineers to adopt the kilowatt as a unit of power was finally overcome by proposing to call this unit the "neupherd," or "new horse."

Mr. Leo Schüler, of Berlin, declared that the prefix "myria" is a term that has little use in engineering nomenclature in America or abroad. The Verband Deutscher Electrotechniker, he said, now rates motors in kilowatts.

Mr. H. M. Hobart declared that the use of the ton is one of the chief difficulties in transferring American units to metric equivalents. The English ton is, however, almost exactly equivalent to the metric ton.

Induction-Motor Load Losses

In their paper on load losses of induction motors, Messrs. H. G. Reist and A. E. Averrett recommend measurement of the losses themselves, rather than entire energy quantities, as introducing fewer uncertainties. Load losses may be largely in the form of excess core loss due to teeth saturation and excess copper loss in both primary and secondary. Results of twenty-nine input-output tests quoted show an average of 0.75 per cent lower efficiency by direct measurements than by the method of losses. The authors conclude that load losses will not occur without saturation and that excess copper losses need not be allowed for with wire-wound stators.

Stray Losses in Induction Motors

The author, Mr. A. M. Dudley, calls attention to the fact that the "load losses" referred to in the present Standardization Rules include certain losses not actually present when the motor is running under normal conditions. After pointing out means for segregating the real load losses from other losses observed in the power input to the motor at standstill, Mr. Dudley concludes that small wire-wound motors have no load losses, although such losses appear in larger sizes and with certain types of conductors. He recommends taking these facts into recognition in revising Rule 167.

Induction-Motor Losses

Mr. R. W. Davis recommends that the true fixed loss be taken as the power input when the motor is running at rated voltage and without load, minus the stator-copper loss produced by the magnetizing current. In slow-speed motors this loss is appreciable. The stray or eddy-current loss in the stator copper is proportional to the stator-copper loss, the percentage depending on the degree of lamination employed. Six per cent is an average commercial value for 25-cycle and 60-cycle machines. As no commercial method of determining the average value of the stray loss is available, the author proposes that an average value in terms of the stator-copper loss be adopted. In squirrel-cage and small wound-rotor motors having slips greater than 2 per cent the total rotor loss should be taken from the slip reading when operating at full-load.

Discussion on Motor Losses

Among those taking part in the discussion on induction-motor losses were Messrs. B. G. Lamme, A. E. Averrett, B. A. Behrend, C. P. Steinmetz, James Burke, H. M. Hobart, Leo Schüler, R. E. Hellmund, C. J. Fechheimer, C. A. Adams, Alexander M. Gray, L. T. Robinson and M. G. Lloyd.

Transformer Losses

Mr. W. W. Lewis proposes to divide transformer losses into no-load losses, including core and dielectric losses, and load losses, made up of resistance and stray losses. From a study of impedance watts and load losses it is concluded that they are practically the same in value. The paper presents results of practical tests on commercial machines, giving stray losses, dielectric losses, etc. The author recommends revision of the Institute rules to agree with the definition and division of losses above given, and he further suggests that all losses be measured at the operating temperature.

Stray Losses in Transformers

From a theoretical standpoint, Messrs. C. Fortesque and W. M. McConahey show that the copper loss and regulation of a transformer, considered as a pair of mutually inductive circuits, may be derived from its short-circuit loss and impedance voltage. With proper design the effects of frequency, wave-form, dissymmetry of winding, permeability of iron, etc., should be almost negligible in the copper losses of the transformer. Even taking into account the physical characteristics of iron, the theoretical determinations based on the mutual-inductance theory need not be modified in order to come within the limits of practical accuracy. Formulas are given for obtaining the equivalent short-circuit loss under full-load conditions, and practical examples of the use of these equations are compared with results of tests.

Discussion on Transformer Losses

Messrs. J. M. Weed, C. Fortesque, James Burke, E. A. Wagner, C. P. Steinmetz, Leo Schüler, B. G. Lamme and

C. F. Scott took part in the discussion on methods of determining losses in transformers.

LOAD LOSSES IN ROTATING MACHINES

The paper describes tests made by the authors, Messrs. E. M. Olin and S. L. Henderson, to determine the load losses occurring in rotating machines. The proposed correction factors are not to be applied to the sum of the separate losses but to the sum of the calculated armature

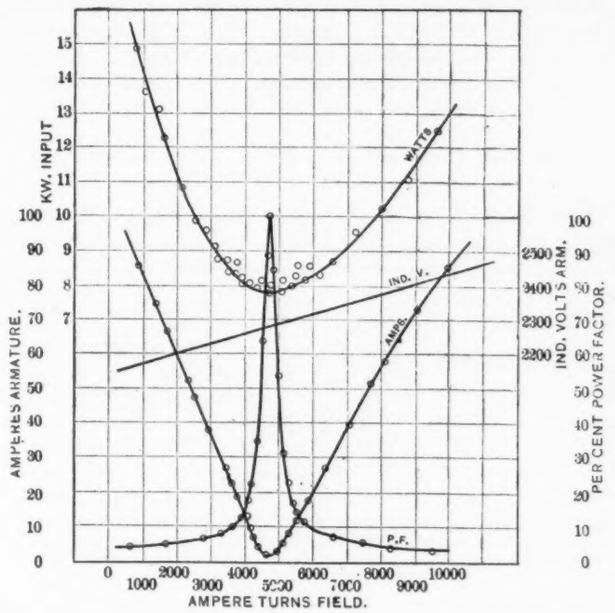


FIG. 5—PHASE CHARACTERISTIC OF 300-KW ALTERNATOR

copper losses and the no-load core loss. The laboratory tests indicated fairly uniform ratios between the sum of these losses under actual load conditions and their sum as determined by no-load measurements. The authors therefore recommend the following correction factors as checking closely with commercial tests:

	FRACTIONAL LOADS			
	0.5	0.75	1.00	1.25
Direct-current motor	1.10	1.20	1.30	1.40
Alternator Synchronous motor	1.01	1.03	1.10	1.20
Synchronous converter, 60 cycles	1.04	1.07	1.10	1.20
Synchronous converters, 25 cycles	1.00	1.00	1.00	1.00

LOAD LOSSES OF ALTERNATING-CURRENT GENERATORS

The accurate determination of load losses in well-designed generators is difficult, for the losses are themselves small, according to the authors, Messrs. W. J. Foster and Edgar Knowlton. The circulating-energy method is recommended where duplicate machines are available, since this scheme measures the losses of both machines, enabling variations of any size to be detected. From a study made with three machines to find a method of accurately measuring load loss when but one machine is available, the authors observed that load loss is approximately equal to short-circuit core loss, although the present meagerness of data does not justify establishing this statement as a general rule. Fig. 5 shows characteristic curves of a 300-kw unit.

STRAY LOSSES IN SYNCHRONOUS MACHINES

From an analysis of a variety of machines, Mr. F. K. Brainard insists that provision of the present Institute rule allowing for stray loss as one-third of the short-circuit core-loss is entirely too small. When well built, modern moderate-speed machines show little short-circuit loss in the armature core, the armature resistance loss plus eddy-current loss accounting for practically all losses observed. In high-speed turbine-generators, however, a large loss appears on short-circuit, and this remains unexplainable by the eddy currents in the conductors. There is probably an appreciable additional loss with actual load, on account of the increased magnetic leakage from the field resulting from the increased excitation required. Mr. Brainard recommends a larger allowance for stray loss than is at present approved.

STRAY LOSSES IN COMMUTATING MACHINES

Messrs. H. F. T. Erben and H. S. Page undertake selection of empirical factors for estimating stray-loss values in direct-current apparatus, without the necessity for actual tests. The paper discusses the two elements of stray loss—commutation loss and loss due to flux distortion—and describes methods of testing for stray losses, giving results of actual tests. Curves presented show the values for stray loss on commercial machines, affording a basis for suggestions concerning multiplying factors.

STRAY-LOSS MEASUREMENTS FROM INPUT-OUTPUT TESTS

With careful input-output tests, declares Mr. L. T. Robinson, certain direct-connected sets can be tested with an error less than 0.2 per cent, a degree of precision smaller than the limits within which the efficiency is likely to remain constant. Where the no-load losses fail to remain constant the efficiency sometimes becomes indefinite within 0.5 per cent. Without checks by determination of the smaller losses direct methods are seldom conclusive, since they do not include all sources of loss or realize operating conditions completely. Accurate input-output tests require too much time and labor for regular commercial use, although they are valuable as a basis of final reference. The paper closes with a number of comparisons of efficiency determinations made by input-output and loss-segregation methods.

EFFICIENCY DETERMINATIONS OF ROTATING MACHINES

When the efficiency of a machine is determined by the method of summation of separate losses the effect of possible errors, as pointed out by Messrs. E. I. Chute and William Bradshaw, will be much less than when the measurement is made by the input-output method, since in the latter all determinations enter directly into the final result. Errors likely to arise are those of the instruments themselves, incorrect observations and changes in operating conditions. Swinging of instrument pointers may introduce considerable error unless prevented. The efficiency as determined by the loss method, while not the true operating efficiency, can be so modified by certain factors depending on the type of machine as to approach closer to the actual value than the results obtained with the average input-output method. In view of laboratory limitations in commercial plants and the equivocal results usually attained, the authors do not recommend the input-output method.

Discussion on Generator Tests

Discussion of the subjects of alternating-current and direct-current generators and errors of tests was postponed to the evening session of Thursday. Among those taking part were Messrs. Edgar Knowlton, G. F. Brown, E. F. Collins, R. E. Hellmund, W. J. Foster, F. D. Newbury, B. G. Lamme, H. F. T. Erben, B. A. Behrend, James Burke, C. P. Steinmetz, E. M. Olin, L. T. Robinson, C. J. Fechheimer, John L. Harper, E. I. Chute, M. G. Lloyd, H. M. Hobart, W. F. Dawson and R. D. Mershon.

BRUSH FRICTION AND CONTACT LOSSES

Messrs. H. T. Erben and A. H. Freeman call attention to the present insufficiency of A. I. E. E. rules on brush-loss

determinations. These losses include both sliding friction and brush-contact drop, but the quantities involved are often too small for ordinary means of measurement. To observe the effect of wide temperature ranges on brush friction, a commutator was operated in an asbestos-lined box heated by grids to temperatures between 40 deg. and 100 deg. C., but the variation in power required to drive the commutator at different temperatures was found to be negligible. The paper includes a number of curves presenting values for friction, contact drop, etc., for various commercial brushes at different speeds. The authors propose that brush friction be hereafter calculated from data and by methods having Institute approval, instead of using present inaccurate test methods.

Contact and Friction Brush Losses

The resistance of the contact beneath the brush varies with brush composition, pressure, temperature, humidity, current density, etc., according to Messrs. H. R. Edgecomb and W. A. Dick. Their present investigation studied two surface variations which may cause large errors: (1) Large momentary fluctuations in contact-voltage loss, caused by changes in brush surface. (2) Decrease in voltage loss by formation of a thin carbon coating on the commutator which provides a conducting medium between the brush and the commutator. The power required to overcome brush friction depends upon brush composition, angle of setting, surface, pressure, speed, etc. The authors advocate data tests under ideal conditions on which to base loss determinations superseding the present commercial tests.

Commutation and Brush Loss

Great variations are found in brush-loss tests, even when made on slip-rings or special commutators, and such tests as usually carried out are virtually worthless for practical use. There is difficulty, adds Mr. C. E. Wilson, in separating actual brush loss from commutation loss. In parts of the brush current densities are found of three times the apparent average density. If local currents be eliminated by using narrower brushes, resistance leads or interpoles, higher average densities are permissible. Brush resistance decreases with increasing current, although at present no way of calculating or measuring the actual loss at the brushes is known. The increase actually occurring is to be regarded as a commutation or load loss, being considered one of the stray losses of the machine.

Discussion on Brush Losses

Among those who took part in the discussion of brush losses were Messrs. T. M. McNiece, L. R. Berkeley, E. H. Martindale, H. F. T. Erben, Leo Schüler, B. A. Behrend, Alexander M. Gray, C. A. Adams, A. H. Freeman, B. G. Lamme, R. B. Treat, R. B. Williamson, John L. Harper, L. T. Robinson, W. H. Powell, F. D. Newbury and L. E. Underwood.

Mr. Lamme said that in testing a 2000-kw homopolar generator fitted with one set of iron collecting rings and one set of bronze rings the losses in the iron rings due to magnetic action were found to be 200 kw greater than those in the bronze rings. The use of iron rings, he pointed out, must depend upon local conditions, presence of magnetic fields, etc.

Mr. R. B. Treat said that the period of seasoning of commutators depends upon the characteristics of individual machines. One source of chattering, he pointed out, is caused by loose collector rings, although the degree of looseness may be so small as to be quite imperceptible to the hand when the machine is at a standstill.

Methods of Loading Large Machines for Temperature Tests

Mr. F. D. Newbury's paper compares various methods of loading larger alternating-current and direct-current generators and rotary converters for factory temperature tests. The tests discussed are those of separate open-circuit and short-circuit loading, alternate open-circuit and short-circuit loading, direct-current open-delta loading, and zero-power-factor loading. The first two are declared unreliable, although the first method named requires least testing equipment. The third method checks well with actual operation, while the fourth approaches most nearly to actual conditions, exactly corresponding to service operations in all respects except power-factor and imposing even severer conditions in this regard. Mr. Newbury recommends Institute adoption of the zero-power-factor method and suggests the loading-back method for tests of direct-current generators and rotary converters.

Load-Test Methods for Alternators and for Induction Motors

In comparing the methods of making load tests on alternating-current generators and induction motors, Messrs. E. F. Collins and W. E. Holcombe describe the most practical methods adapted for load-temperature runs using a limited amount of power. For alternators approved methods are: (1) zero-power-factor method; (2) open-circuit and short-circuit method; (3) open-delta method, and (4) phase-displacement method. For induction motors: feeding back; reduced voltage, and reversed rotation. Actual test data cited show the close agreement between temperature-rise results by the equivalent-load and actual-load methods. The paper includes a full discussion of the advantages and drawbacks of the various methods described and recommends the special application of each.

Load Tests on Large Induction Motors

Complete factory tests of induction motors, as enumerated by Mr. A. M. Dudley, include checks on the efficiency, power-factor, torque, heating, noise, mechanical balance and temperature. It is usually necessary and desirable, however, to make compromise tests of temperature, and the author describes some methods employed. From five examples in which actual test results are compared with compromise tests on the same machines, the close agreement of the results is shown. The methods outlined in the paper, the author gives assurance, afford results which are always safe, although approximating closely to actual test conditions. In concluding the author recommends that the Institute recognize the various methods of conducting compromise tests, with their reliability and limitations.

Discussion on Generators and Motors

Among those taking part in the discussion of methods of testing generators and induction motors for performance were Messrs. F. D. Newbury, A. E. Averrett, R. B. Williamson, R. E. Hellmund, B. G. Lamme, Leo Schüler, E. I. Chute, P. M. Lincoln, Alexander M. Gray, B. A. Behrend, H. M. Hobart, S. L. Henderson, J. K. G. Madden, C. P. Steinmetz, W. J. Foster and S. S. Seyfert.

Mr. Leo Schüler urged upon the Institute consideration of the undesirable results which might follow from making equivalent tests a part of the Standardization Rules, suggesting instead the incorporation of these tests in an appendix, if necessary.

Mr. E. I. Chute declared that the simpler the tests the better, and he urged careful consideration of the matter of duplicating results.

Mr. P. M. Lincoln explained that the manufacturer's facilities for applying power tests are often limited. The zero-power-factor test he declared is even more severe than normal load and is the most satisfactory of the test methods.

Mr. F. D. Newbury assigned the direct-current circulating test a place next to the zero-power-factor test in

point of satisfactory results, putting this circulating test ahead of the intermittent test.

LOAD TESTS ON TRANSFORMERS

When only a single transformer is available for a test in which actual load is not to be applied, Mr. J. J. K. Madden describes how heat runs may be made by applying intermittently an over-voltage core-loss with an over-current impedance loss. Approximate temperature results can be obtained by combining an ultimate open-circuit heat run with an ultimate short-circuit heat run. The intermittent-run method is recommended for tests of a single single-phase transformer, and although this method may be modified to obtain closer refinement, sets of figures presented in the paper compare the results of these test methods with the dead-load and motor-generator methods. The over-voltage and over-current to be employed must depend, however, upon the individual transformer's characteristics, lest injury be done to its windings.

SOURCES OF ERROR IN TRANSFORMER TESTS

Messrs. W. M. McConahey and C. Fortesque discuss precautions to be observed, mentioning proper selection of instruments, care in reading scale deflections, attention to ratio and polarity determinations, etc. Among the topics treated are tests for copper loss and impedance, iron loss and magnetizing current, manner of making heat runs, testing of insulation and over-potential tests.

RATING OF OIL CIRCUIT-BREAKERS

Mr. G. A. Burnham advocates a universal method of rating oil circuit-breakers with reference to their instantaneous rupturing capacity, thus eliminating many variables. All reference might then be omitted to non-automatic, cell-mounted, pipe-frame, time-limit-tripping and other oil-switch qualifications, by rating the rupturing capacity on a "maximum instantaneous" basis, since the oil switch itself is the essential factor and the addition of various accessory apparatus leaves the rupturing capacity unchanged.

Messrs. P. M. Lincoln, M. G. Lloyd, F. D. Newbury, R. F. Schuchardt and C. A. Adams took part in the brief discussion on the subject of circuit-breaker ratings.

THE SPHERE SPARK-GAP

Messrs. S. W. Farnsworth and C. L. Fortesque point out the limitations of the needle spark-gap and recommend instead the use of a gap with two equal spheres. If the latter are used with a separation less than their diameter, corona and resultant inconsistencies do not appear. Large spheres, of course, will be required for high voltages. Such gaps have already proved successful in commercial test work. They are reliable, convenient, portable and compact. For standards, the use of spheres 25 cm, 37.5 cm and 50 cm in diameter is proposed, covering ranges of 50,000 to 275,000, 50,000 to 412,500 and 50,000 to 550,000 volts effective values. For pressures below 50,000 volts a smaller size of sphere should be used, although the authors as yet offer no recommendations. The sphere-gap affords more consistent results than the needle-point method, since its break-down is little affected by air pressure, humidity, proximity of neighboring bodies, etc.

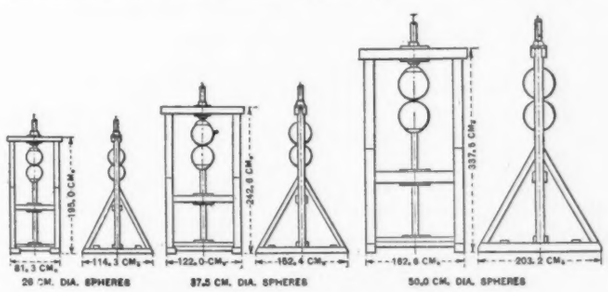


FIG. 6—STANDARD SPHERE SPARK-GAPS

CALIBRATION OF SPHERE-GAP VOLTMETER

Mr. C. Fortesque and Mr. L. W. Chubb report that the surface intensity at break-down and ratio of separation to diameter observed with sphere-gaps show the ultimate strength of air to vary from 3 kilovolts to 3.6 kilovolts per centimeter within the working range. Extraneous objects, however, may prevent the theoretical proportion between voltage, separation and diameter from holding throughout the range. The paper presents tables of direct calibrations for pairs of 25-cm, 37.5-cm and 50-cm spheres, taken up to a maximum pressure of 400,000 volts. The test results show break-down to be independent of wave-shape and frequency when expressed in terms of the maximum value of the voltage wave. Calibration curves were also obtained for the spheres, at separations from low-voltage up to diameter distance. As the curves are expressed in effective values of voltage, they assume a sine-wave shape.

Discussion on Spark-Gaps

Mr. F. W. Peek pointed out that the results obtained with needle-gaps may vary as much as 20 per cent, depending on the humidity, although sphere-gaps are practically independent of moisture if the spacing be small with respect to the diameter.

Mr. C. E. Skinner declared that the accuracy of the sphere-gap method is proved by the close agreement of the observations of many experimenters during several years' work. On no other subject brought before the present standardization meeting, Mr. Skinner pointed out, was there such general approval and unanimity as with respect to the superiority of the sphere-gap over the older method. Some little difficulty, he said, has been experienced in obtaining accurate spheres of the required diameters.

Mr. G. H. Sanford pointed out that with the sphere-gap the observer can make adjustments with the voltage on the test piece, moving the electrodes gradually closer together until the break-down point is reached. Considerable time is thus saved over the needle-gap method, which required stationary settings for each piece.

Mr. James Lyman reported some earlier experiments of his own in which sphere-gaps had shown wide variations in break-down voltage, the discrepancy ranging between 20 and 25 per cent. In order to obtain the best results, he found it necessary to amalgamate the brass spheres after each discharge in order to secure perfect spherical surfaces.

Mr. L. W. Chubb urged that amalgamating brass spheres might reduce their accuracy since the mercury attacks the zinc in the brass, causing distortion of the entire mass.

Dr. Percy Thomas pointed out that the sphere spark-gap has a comparatively high electrostatic capacity and may hence require a certain charging current not involved with the needle-gap. If a series resistance be inserted in series with the sphere-gap, the drop measured will be indefinite. While these effects may not introduce discrepancies at low frequencies, care must be observed at higher frequencies lest accurate results be interfered with.

Dr. C. P. Steinmetz cited his own earlier experiments in which he found time lags of the order of 0.0001 of a second. This lag, as he pointed out, is really an energy lag, due to the fact that it is necessary to accumulate energy at a potential high enough to break down the gap. For comparatively low pressures, those up to say 20,000 volts, the needle-gap may continue to be standard. Others who took part in the discussion were Messrs. C. A. Adams, S. W. Farnsworth, C. Fortesque and W. S. Franklin.

POTENTIAL WAVES OF ALTERNATING-CURRENT GENERATORS

In stating at the outset his purposes in preparing this paper the author, Mr. W. J. Foster, sets down the following threefold aim: (1) to show potential waves closely re-

lated to the evolution of alternators; (2) to exhibit the effect of load and other conditions on the no-load and open-circuit wave; (3) to give illustrations of commercial wave-forms, good, bad and indifferent, as actually employed in service. The paper is illustrated with nearly 100 wave illustrations. The general effect of load is slightly to broaden the top of the wave, bending it to the left and making it somewhat unsymmetrical. An inductive loads tends to smooth out the harmonics, a condenser load to emphasize them. Among the conditions for obtaining proper wave-shape is the proper shading of magnetic flux by shaping the poles or distributing the windings, and an irregular though prime relation between the number of slots in the armature and the number of poles.

Effects of Wave Distortions

Mr. P. M. Lincoln observes that the present A. I. E. E. rule in regard to wave-form is not satisfactory in that it fails to penalize adequately the higher-frequency harmonics. The author discusses various conditions, among them the situation involved where two differing wave-forms are connected in parallel, showing the resultant effect on the current wave. In some cases very great current-wave distortion may occur, or large exchange currents may flow between machines. The paper concludes with a discussion of wave-form errors in power-factor meters and other instruments.

Proposed Wave-Shape Standard

The wave-shape standard proposed by Mr. Cassius M. Davis would make use of the principle of change in effective reactance of a condenser with change of wave-form.

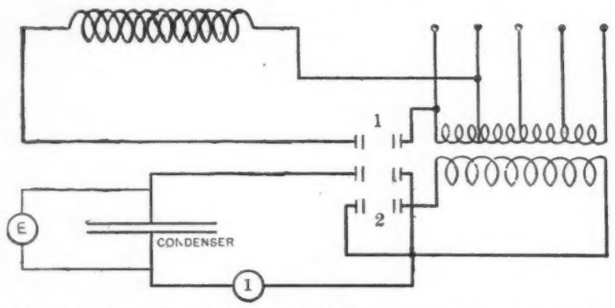


FIG. 7—CONDENSER CONNECTION FOR MEASURING STANDARD WAVE-FORM

Among its advantages over the present standard (which has objections in its use of the oscillograph, length of calculations and tendency toward higher harmonics) would be the following: Wave distortion could be determined quickly; distortion would depend upon the order and magnitude of harmonics present; the apparatus is simple and the tests require little technique. The ratio of the condenser reactance on a sine wave to the condenser reactance on a distorted wave is called the distortion ratio. It is measured by first impressing the wave on a condenser in series with large inductive reactance, and then across the condenser alone. The distortion ratio of generators should be tested at no load, since under load the wave length is indefinite.

Discussion on Wave-Form

Among those who took part in the discussion of wave-form and determination of wave-shape standards were Messrs. G. B. Smith, W. L. Waters, F. M. Farmer, T. Reed, C. P. Steinmetz, B. G. Lamme, A. E. Kennelly, M. G. Lloyd, L. W. Chubb, D. C. Jackson, C. A. Adams, P. M. Lincoln, L. T. Robinson and C. M. Davis.

Regulation of Alternators

At low power-factors, according to Mr. A. B. Field, the method of determining the regulation of an alternator as set down in the Standardization Rules is inaccurate, taking no cognizance of varying pole leakage or of the ratio of armature reaction to reactive voltage drop. These effects are marked at zero power-factor. Since this is the usual condition for taking regulation curves, it is advocated that regulation be based upon the saturation at zero power-factor and the no-load saturation. The author suggests revision of the present rules in accordance with suggestions submitted by him in a paper ten years before, drawing attention to the importance of the zero-power-factor curve.

Regulation of Definite-Pole Alternators

Mr. Soren H. Mortensen suggests that the triangle method be used for obtaining the regulation of alternators, instead of the scheme now recommended, which is based on the use of the no-load saturation short-circuit curve and armature resistance. The latter method he asserts, often gives incorrect results. The tests required are the same as with the present A. I. E. E. method, the regulation being derived, however, from the Kapp diagram based on estimated full-load zero-power-factor saturation curve, in turn determined by aid of Potier's triangle. Tables presented by the author, comparing the triangle and A. I. E. E. methods with the results of actual tests, show the superior accuracy of the proposed triangle method.

Generator and Prime-Mover Capacities

In their paper on generator and prime-mover capacities Messrs. D. B. Rushmore and Eric A. Lof pointed out the desirability of considering turbo-generators as units. Turbo-sets are in operation in which the output is limited by a discrepancy in the ratings, the prime mover being either too small or too large for the generator. Units are now being rated on a maximum or constant continuous rating, which should not be exceeded except during momentary peaks. Steam-turbine units have been thus rated with entirely satisfactory results. It is also becoming quite common with waterwheel-driven units. For the sake of standardization it seems desirable to give all generators a maximum constant continuous rating at a certain specified temperature.

Among those taking part in the discussion of the papers on machine regulation and prime-mover capacities were Messrs. F. D. Newbury, S. S. Seyfert, B. G. Lamme, C. A. Adams and Alexander M. Gray.

Close of the Convention

In summing up the work of the convention, Mr. B. G. Lamme, member of the standards sub-committee, pointed out the difficulty of making accurate measurements, loading machines, etc. Certain losses which were discussed by the convention, he reminded the Institute, are after all small quantities in themselves and often quite negligible. The results of the discussion and the divergence of opinion expressed, said Mr. Lamme, are both discouraging and encouraging; especially, however, the latter, since the attention of the industry is thus being called to matters in which it has been lacking. Taking load losses as an example, since, said the speaker, it is often too costly to measure them accurately, they should be eliminated or provisions made for protection against them. The manufacturers are now acquiring that exact knowledge in which they have been lacking. The present convention, said Mr. Lamme, has set a pace hard to follow.

Retaking the chair from Dr. A. E. Kennelly, who presided during the technical sessions, President Ralph D. Mershon congratulated the Institute on having completed one of the most successful gatherings in its history and predicted that a mid-winter meeting, devoted strictly to business discussion, would become a regular feature of the annual program. After brief remarks by Mr. C. F. Scott, on behalf of the standards committee, and Mr. Leo Schüler, delegate from the Verband Deutscher Elektrotechniker, of Berlin, the convention adjourned.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

Minneapolis Electrical Board

As a result of the dinner given recently by the Minneapolis General Electric Company to the electrical contractors and representatives of other electrical interests in that city, noted on page 300 of the Feb. 8 issue of the *Electrical World*, an organization styled the "Minneapolis Electrical Board" has been formed. This board consists of seven members, there being a representative of the wholesale houses, the retail dealers, the sign manufacturers, the contractors, the fixture dealers, the municipal inspectors' department and the central station. The board will meet once a month for the discussion of matters of common interest, and every effort will be made to further the electrical development of Minneapolis.

Wholesale Disposition of Ice Output

One of the comparatively large combination ice-electric plants of the country supplies a Western city of 30,000 inhabitants. The 60-ton steam-driven compressor equipment and freezing tank cost approximately $1,000 per ton of rating and operates for from six to eight months during the year.

Under these conditions it is estimated that the ice manufacturing cost averages about $1 per ton. The entire output is disposed of at wholesale, bringing $3.60 per ton, so that a substantial income is added to the earnings of the electrical equipment. Distilled water reclaimed from the engines driving the electrical generators is used for freezing purposes. Ice storage capacity up to several hundred tons enables the refrigerating machinery to be uniformly loaded without respect to the varying demands of the local consumption.

Successful Central-Station Lecture Service

The lecture division of the Boston Edison Electric Illuminating Company's advertising department has been carrying forward important work this winter in popularizing the use of electric service in many parts of eastern Massachusetts. Up to the middle of February more than thirty-five lectures had been given by representatives of the company before men's and women's clubs, classes of children and young people in the graded, trade and evening schools and church societies and lodges. Over 4000 persons have attended the lectures so far this season. The work has been handled by Mr. L. D. Gibbs, superintendent of advertising, with the assistance of Messrs. La Rue Vredenburgh and F. C. Hard.

In connection with the lecture service a special program of entertainment and instruction has been arranged for the demonstration of electric cooking and heating. A kitchen table of the "knock-down" type, with a special crate for easy shipment, has been equipped with outlets and a cable which can be connected in service wherever the appliances are to be used. Other crates have compartments for appliances and for the small supply of dishes used in places where no other means for furnishing refreshments are available. The entire equipment can thus be shipped promptly and easily by express to the place where the lecture and exhibition are to be given, and there assembled and dismantled with speed and convenience.

Referring Appliance Purchasers to Dealers

The relation of a public-service company with the electrical contractors of its community, so far as the sale of electric utensils or supplies is concerned, should be clearly defined in order to promote good feeling between everyone involved. Care is taken to make this a feature of the policy of the Louisville (Ky.) Lighting Company.

Although itself exhibiting for sale a wide range of electric equipment for home, office and store—a stock, in fact, much more comprehensive than any but the largest dealers could afford to carry—the Louisville company makes a point of soliciting appliance business by sample demonstration of the utensil, in the end directing the purchaser to the nearest supply house. Of course, if a customer insists on buying from the central-station company and no one else, the company is naturally prepared to meet the demand. But wherever possible the business is turned over to the specialist in this line.

Miniature Distribution System in Window Display

To afford a better popular understanding of the methods of producing and distributing electrical energy, the Worcester (Mass.) Electric Light Company recently installed in one of its main-office show windows a model depicting the various steps, from coal mine to home, in the production and supply of electric service. A miniature mine shaft and colliery are connected by a railroad track with the coal pocket of a tiny power station. This generating plant contains boiler, engine and dynamo equipment, and its outgoing pole lines lead to a small substation from which local distribution circuits run to a doll house. The little dwelling is wired complete with miniature lamps and is equipped with tiny models of an electric flatiron and sewing machine. En route to the house, taps from the overhead distribution circuits at various points are taken to miniature street lamps, and in the model substation a practical lilliputian switchboard controls the service to these lines. Energy to operate the display comes from the company's office circuit, but the sequence of operations from coal mine to household lamp is clearly shown and the exhibit has earned much favorable local comment.

Quick-Service Connection in an Emergency

At 11 o'clock on a recent Saturday morning the commercial department of the Baltimore Gas & Electric Company received a telephone call from a local physician who explained that it was absolutely necessary that service be furnished a certain residence for operating an X-ray machine in connection with an operation about to be performed. Investigation showed that no electricity had ever been supplied to this building, so that it was necessary to arrange not only for the outside service run but also the interior wiring.

A man from the wiring department was at once dispatched to the premises to reconnoiter. After finding what was needed he telephoned the distribution department, with which arrangement had already been made for quick handling of the service order. This order came through at

12 o'clock noon, and at 1:15 p. m. the distribution department had the service installed and working. It was needed for only an hour, as had been explained by the physician beforehand, and after serving its purpose the wires were removed.

Electric Ice Making "Farthest North"

The Consumers' Ice Company, Ltd., of Winnipeg, Manitoba, Canada, is installing a 100-ton motor-driven raw-water ice factory which will be operated by central-station energy purchased at an advantageous rate from the Winnipeg Electric Railway Company. The 100-ton refrigerating equipment is divided into two duplicate sets, each comprising a 150-hp, 2200-volt, 60-cycle Lincoln motor driving a 50-ton compressor made by the Arctic Ice Machine Company of Canton, Ohio.

Auxiliary equipment for the ice factory includes two 5-hp air-compressor motors, two 7.5-hp brine-pump motors, two 5-hp thaw-pump motors and one 20-hp deep-well pump motor. In addition to the main ice machines there is an auxiliary 5-ton compressor, driven by a 10-hp motor, this set having been provided for use in holding temperature when the principal units are shut down.

This electric ice factory is expected to operate at nearly full rated output throughout the entire year, despite the extremely low winter temperatures for which Winnipeg is famous. Besides the hotel and club customers whose ice consumption continues uniform during the winter season, it is estimated that the domestic consumption during the cold months approximates 60 per cent of the summer demand. This is explained, paradoxically enough, by the very great cold itself. This low temperature, it is declared, makes it impossible for the housewife to put provisions outdoors lest they be completely frozen. In consequence many homes make use of their refrigerators all the year around.

Lighting a Large Sign at Low Cost

The advent of the tungsten sign lamp has given a new impetus to billboard lighting. When such lamps are combined with proper reflectors surfaces of unusual size may be illuminated at low cost. The accompanying illustration shows a billboard in Providence, R. I., which is about 25 ft. high and 50 ft. long. The illumination is furnished by six 100-watt tungsten lamps carried in suspended reflectors at

ADVERTISING AT LOW COST

the front of the board. The cost of operation is only about 6 cents per hour, but by night the sign is one of the most striking objects seen from the street below. The lamps and reflectors are hung by strong wires and are notable for their inconspicuous appearance. The reflector area is so small in relation to the size of the board that the light sources do not appreciably interfere with the advertisement.

Annual Profits of $5,950 from $10,000 Ice-Plant Investment

In a Western plains city of 3500 population, on the same line of latitude with Omaha, the electric company several years ago invested $10,000 in a 10-ton ice plant to be operated in conjunction with its electrical equipment. This ice machinery now produces 1200 tons annually at a net cost of $1.28 per ton under full-load operating conditions, netting its owners a profit of nearly $6,000 per year, or about 60 per cent return on their outlay. The ice-making season lasts but four months in this climate, so that the ice equipment earns this income in about 120 days.

The compressor plant, freezing tank, etc., cost $9,000, to which must be added $500 for teams and wagons and $500 for miscellaneous equipment, making the total investment $10,000. Locally the domestic price for ice, delivered, is 45 cents per 100 lb., although a quantity of the product is sold wholesale from the platform for $4 per ton. A cold-storage room provides space for holding 75 tons of ice under artificial refrigeration.

Last year the 1200-ton output brought a gross income of $7,500. Plant expenses chargeable to ice making were $1,500, as follows:

Gross income from ice business	$7,500
Expenses, including depreciation, interest, etc.	1,550
Net profit from ice making	$5,950

In general, this company finds its wholesale business much more satisfactory than selling ice by retail to domestic users. The annoyances and misunderstandings of delivery are avoided, and while the net return per ton are diminished, much wear and tear is saved for the management. In seasons when the natural-ice crop is light, the plant ships thirty-five to forty carloads of ice per season to nearby towns, receiving $3.50 per ton f.o.b. in carload lots.

The Central Station and the Consulting Engineer

In its treatment of consulting engineers the central station often overlooks important opportunities open to it for increasing its industrial motor load. At the present time few consulting engineers are enthusiastic about central-station service. It is quite natural that they should not be, for the central station is their competitor in doing the engineering work, and even though an engineer is retained on a motor installation the fee is much less than where a steam plant is installed.

Now, the consulting engineer is the logical arbiter of the question "central station versus isolated plant," and if the central station is to get the business which is rightfully its own, then its attitude toward the consulting engineer should be such that he will consider the question impartially. The first step in bringing about such impartial consideration is in having central-station salesmen recommend to customers that they retain an engineer to decide the power question. In spite of what disappointed salesmen have to say, established consulting engineers are almost without exception both honest and fair. They can weigh the motor-service salesman's arguments much better than the plant owner, and the central station will have a better chance of getting the business to which it is fairly entitled.

It is self-evident that the central station's recommendation will be appreciated by the consulting engineer and that he will give the company's statements and view of the conditions ample consideration. A report from his own consulting engineer will carry much more weight with the customer than the central station's report. The engineer's statement will not be discounted as would a partisan report, or be subject to possible prejudice against the central station.

He himself being qualified to judge of the accuracy of

every claim, either steam or electrical, the consulting engineer would gladly have the central station's case presented by a fully competent power engineer. Then if the facts in a particular case favored the isolated plant, such an industrial service engineer could be shown the conditions and the reason for the decision, and the consulting engineer would feel no fear of discrimination against him by the central station on future work. In fact, the graceful acceptance of his decision in such a case would be the best kind of salesmanship.

Another important point in getting on a friendly basis with the consulting engineers is to let them understand that the central station is glad to help them secure the engineering on motor installation and, furthermore, this must be the sincere practice of the central station.

The argument that the purchase of central-station service would save consulting engineers' fees would have to be dropped. However, that argument has opened the door for one of the most pernicious forms of selling ever practised. The buyer considering a source of power for his new factory would like to compare the concise proposal of the central station with the jumble of opinions and proposals submitted by the steam-equipment men. He would like to have a definite guarantee of his electrical and heating costs. But the central-station salesman has rubbed in the argument that a consulting engineer's fee is money wasted, and that the engineer will decide in favor of the steam plant anyway. So the door is open for the agent of several lines of steam apparatus or the manufacturer of major equipment, such as engines, to step in with a proposal on a complete plant for a definite sum, guaranteeing to deliver electrical and heating service for a given cost per unit. This cost is reduced to the minimum by using the cheapest equipment throughout and by basing the guarantees on fixed prices for labor, repairs, fuel, and especially depreciation, which will not stand inspection by a competent judge. On the trial test the economy may be shown, but the buyer will appreciate his bargain at its real value in a very few years when the inferior equipment begins to fall apart. Such misrepresentation could be eliminated by the retention of a consulting engineer.

Ice-Plant Investment and Returns in Town of 2300

During its four months' ice-making season, the 15-ton steam-driven compression plant operating in a Kansas town of 2300 inhabitants turns out 2800 tons of ice. Distilled water regained from the condensation of the various plant engines, including the ammonia compressor, is used for freezing. The $16,700 investment in the ice-plant department is apportioned as follows:

Ice-plant addition to building	$2,000
15-ton steam-driven compressor	13,000
Freezing-tank equipment	1,200
Wagons	500
Total ice-making investment	$16,700

In addition to the refrigerating equipment proper, the company recently installed cold-storage capacity for 1000 tons of ice, thus enabling it to hold and conserve its product to meet the variations in demand. This 1000-ton ice storage cost $6,000, bringing the total outlay for the ice department to $22,700.

To produce a ton of ice at the station platform, the factory cost is estimated at $1.35. The several charges entering into this manufacturing expense are, per ton of ice made:

Fuel	$0.75
Labor, including office salaries	0.30
Water	0.10
Supplies and miscellaneous	0.15
Total factory cost per ton	$1.35

Wholesale this product brings $2.75 per ton. The local retail price is 35 cents per 100 lb., or $7 per ton. Delivery of the ice to retail customers adds, however, a blanket charge of approximately $1.30 per ton, according to the company's cost sheets. Following is the corporation's report on last season's earnings:

Yearly gross income from ice business	$12,000
Expenses for year, including depreciation, etc.	9,420
Net earnings from ice business	$2,580

In offering a word of advice to electric companies which contemplate combination ice manufacture, this operator urges wholesale disposition of the product at the plant, warning the uninitiated against the annoyances of handling retail local delivery.

Simplified Contract Forms for Motor Service

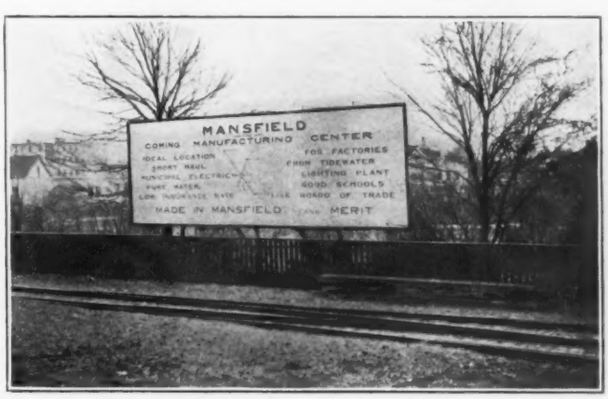
In many cases there is a chance for much improvement in the forms and phraseology of contracts for industrial motor service. Too many central stations take a "high and mighty" position regarding any deviation from their long detailed contract form, which apparently does nothing and guarantees nothing for the purchaser but protects the seller at every turn. The company's attorney may say it is perfect and protects the company completely, but usually it is not the kind of document a business man wants to sign.

A clever sales manager recently did much to remedy this by putting the company's service rules on the back of the contract, leaving on its face a simple agreement to furnish a given quantity of energy at a given price per unit, "subject to the company's regular rules for such service (printed on back of contract)."

No company is so big and mighty that it can dictate every detail in a sale of motor service, and still get all the profitable business it should have. There must be some "give and take." A little more elasticity in contracts will do a lot to increase business for many central stations.

Advertising a Town Electrically

The use of illuminated billboards for advertising to passengers on passing trains the manufacturing and educational resources of a town is growing in favor among local boards of trade alert to improve their opportunities. A



ELECTRICALLY LIGHTED SIGNBOARD, MANSFIELD, MASS.

representative signboard of this sort at Mansfield, Mass., is shown herewith. It is about 10 ft. high and 30 ft. long and is wired for six lamps through brackets at the top of the panel. Two boards of the kind, mounted on opposite sides of the railroad tracks of the principal trunk line passing through the town, form an effective means of attracting the attention of travelers.

Illumination and Wiring

Bracket-Cluster Lighting at Portsmouth, Va.

High Street, the principal business thoroughfare of Portsmouth, Va., was until recently lighted by flaming-arc lamps hung at 100-ft. intervals on both sides of the street, but

FIG. 1—NIGHT SCENE ON HIGH STREET, PORTSMOUTH, VA.

these have now made way for special bracket clusters, each carrying five 75-watt tungsten lamps, as shown in the accompanying illustrations. The brackets are mounted on the tubular iron trolley poles at heights approximately 20 ft. above the pavement, affording excellent distribution over the 97-ft. roadway.

The lamps used are of the 75-watt series type, but are connected in series multiple across the regular lighting secondaries, in order to avoid bringing high-voltage series circuits onto the iron poles. The Philadelphia Electrical & Manufacturing Company, Philadelphia, built the five-lamp bracket clusters from designs suggested by Mr. R. H. Palmer, general superintendent for the Virginia Railway & Light Company, which supplies energy to operate the installation. Each unit is inclosed in a 10-in. Haskins-Lucida ball.

The 75-watt lamp used in the High Street illumination

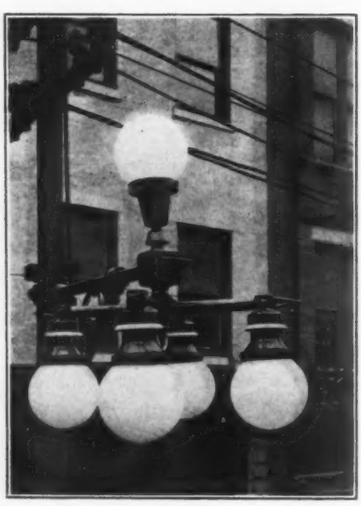


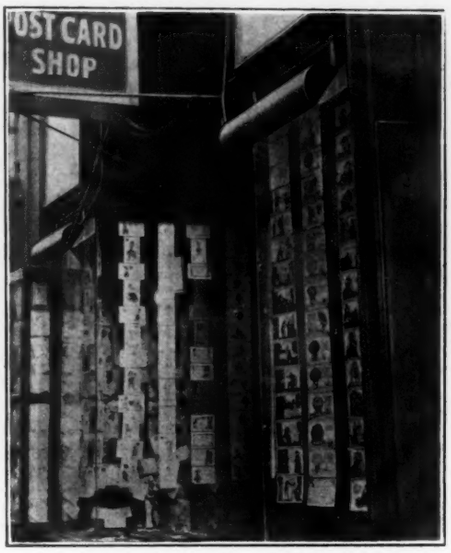
FIG. 2—SPECIAL BRACKET-CLUSTER FIXTURE WITH FIVE 75-WATT LAMPS

has proved to be very popular locally, according to Mr. E. R. Sutherland, commercial manager at Norfolk, nearly 1600 of these units having been already installed in this vicinity.

Attaching bracket clusters to the iron poles used for carrying the distributing circuits has eliminated the necessity of placing more poles on the curb line.

Lighting a Store Window from Outside

The accompanying picture shows the method employed in lighting the windows of a Boston post-card and souvenir store, in addition to the usual interior illumination. The proprietors desired to make full use of the window panes for displaying illustrated cards within a few inches of the spectators' eyes, so that reliance upon interior lighting was



LAMP REFLECTORS OUTSIDE SHOW WINDOW

out of the question. The problem was finally solved by installing two 16-cp lamps in each of two metal reflectors hung in front of and above the window panes by pipe framing. The reflectors are semi-cylindrical in shape and about 18 in. long, with dull exterior finish and polished inside surfaces. At the entrance to the store is an ordinary electric sign as shown in the photograph, while flanking it on either side are the reflectors. The latter work entirely without glare, were inexpensive to build and provide ample illumination over the entire front of each window.

Colorado Theater Installation

The Burns Theater, recently completed in Colorado Springs, Col., furnishes an interesting example of theater installation. The connected load aggregates 85 hp in motors and 4500 60-watt incandescent lamps. Service for the installation is brought over a three-phase, 2200-volt circuit controlled by an oil switch and passing through an alley adjacent to the theater. For a distance of 160 ft. the service is brought in lead cable through iron conduit to the basement, where a reinforced-concrete transformer room with iron safe door is provided. An auxiliary service over a two-wire No. 6 lead-covered circuit is also brought into the same room, where the potential is stepped down for distribution throughout the house. Three 40-kw transformers are used for feeding the lamp circuits and three 25-kw transformers feed the power house. Furthermore, there is an additional auxiliary 10-kw transformer for lighting circuits. The secondaries of the lighting transformers are wound for 110 volts, while the secondaries of the motor-circuit transformers are wound for 440 volts. The three-phase secondaries of the lighting circuits are split at the service board and the building load is balanced as nearly as possible among them. The feeders from the transformers to the service switchboard comprise six 1,600,000-circ. mil conductors inclosed in 6-in. conduit. Two pairs of 1,300,000-circ. mil feeders inclosed in 6-in. conduit carry the energy from the service board to the stage switchboard. The trans-

former room, which is 7 ft. x 12 ft. x 8 ft., is ventilated to the outside of the building only, and recording thermometers show that the maximum room temperature reached is 92 deg. Fahr.

The switchboards used throughout are of the Crouse-Hinds manufacture. The smallest switch is rated at 100 amp and the largest switch at 1800 amp. The main

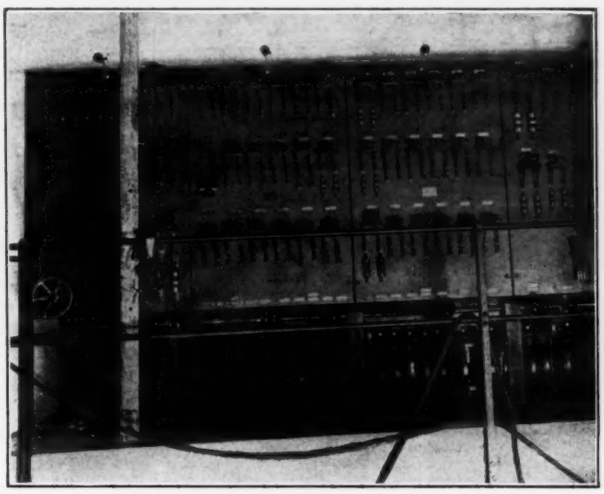


FIG. 1—STAGE SWITCHBOARD AT BURNS THEATER, COLORADO SPRINGS, COL.

motor and lamp circuit switches on the service board are of the double-throw pattern so as to be serviceable in case a private plant should eventually be installed. The dimmers are of the Cutler-Hammer wheel-drive type and control the lamps in the borders, foots and strips, in addition to two 25-amp, two 35-amp and two 50-amp stage plugs and all the lamps in the auditorium excepting the emergency lamps and those over in the exits. The circuits from the switchboard pass through a sectional pull box located behind the dimmers. Red, blue and white lamps are used in the borders, strips and foots, there being twice as many white lamps as

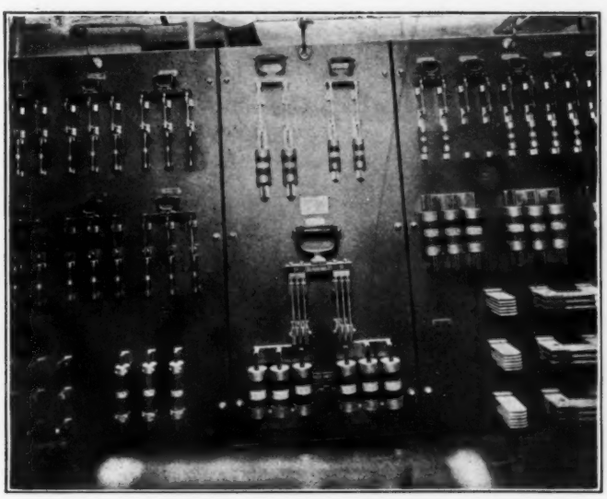


FIG. 2—SERVICE SWITCHBOARD

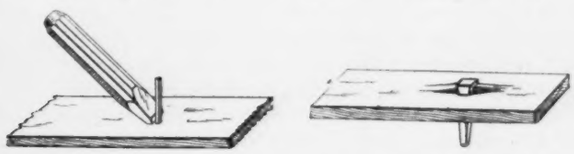
blue or red. Westinghouse tungsten lamps are used throughout.

The electrical installation follows the best standards, the wires being placed in conduit without any loose wires back of the switchboard and with curtain and fan motors completely inclosed. All material used was passed by the Underwriters' Laboratories, and the details of the electrical construction were worked out in conjunction with the city electrician. Messrs. Douglass & Hetherington were the architects and the New York Electric Company, Colorado Springs, Col., was the electrical contractor.

Removing Nails from Trim in Old-House Wiring

BY GEORGE M. TALBOT

Before replacing finished trim that has been removed to permit the running of wires the nails in the trim should be cut off flush with the back of the trim with a pair of pliers



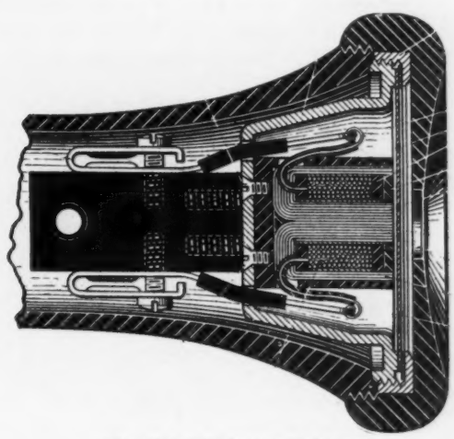
FIGS. 1 AND 2—CORRECT AND INCORRECT METHODS

or a cold chisel (Fig. 1), or should be broken off with a hammer. If an attempt is made to drive them out, they will almost invariably chip out slivers of the trim, as indicated in Fig. 2. New finishing nails of small diameter should be used for refastening the trim.

Recent Telephone Patents

Mr. W. W. Dean, of Elyria, Ohio, has patented an improved receiver, which is shown in section herewith. The object is to expose a large surface of the diaphragm to the magnetic action of the coil, and to this end the core of the coil is formed of fine wires, which are threaded through the bore and turned back over the outer surface. Both core and coil are then impregnated with a liquid insulating material which is allowed to harden, then the exposed core wires are brought down to a plane surface.

A transmitter for aiding deaf persons has been patented by Mr. H. Tideman, of Menominee, Mich. It is the particular object to make a transmitter which shall be equally sensitive to sounds striking it at an obtuse angle and those striking it at right angles. To this end a double conical mouthpiece is arranged, one cone lying within the other,



SECTION THROUGH RECEIVER

so that sound obtains access to the inner cone through a number of small apertures, leaving the diaphragm partly shielded. Sound enters the outer cone through somewhat larger holes. The angles of the walls of the outer and inner cones are so adjusted that sound coming perpendicularly into the outer cone will be reflected from the walls and away from the diaphragm, while sound coming at a considerable angle will be reflected toward the diaphragm.

Letters to the Editors

Co-operation with Employees in Budapest

To the Editors of the Electrical World:

Sirs:—Your editorial in the issue of Feb. 1, 1913, pertaining to aid for the unfortunate leads me to believe that your readers might be interested in the system inaugurated many years ago by the director-general of the Budapest General Electric Company, Mr. Etienne de Fodor. It has always been his desire to obtain a model staff of workers for the company, and since assuming charge of the company's operations he has found that by taking an interest in the private and social life of his men he has obtained the best results as regards efficiency and permanency, which mean a great deal in the running of a central station.

After being in the company's service for a year, every good workman is transferred and listed on the pay-roll as an *employee*, and he then receives a monthly salary which is increased periodically. Thus all the linemen, metermen and emergency men have the title of an employee and not that of a workman, while from their monthly salaries nothing is deducted in case of sickness, vacations or other kinds of holidays. Every employee also receives without cost the services of a doctor and free medicine in case he or any member of his family becomes sick. In serious cases Mr. de Fodor engages a specialist, and if necessary the sick man is sent to a private sanatorium, or to some bathing place in another part of the country where recovery may be hoped for. In case of a death in his family an employee (or in case of his own death his widow) receives a lump sum to defray funeral expenses. In many other cases of a sudden and exceptional need Mr. de Fodor comes forward with a helping hand, and his men understand that what he gives is not charity but well-directed help. It is noteworthy that at the present time several men of the engineer's staff are reserve officers of the army and have been called to the front for the last three months, and that their families are receiving their regular monthly salaries from the company.

When Mr. de Fodor took charge of the company's affairs he started an "aid fund," out of which all of the above-mentioned expenses are now defrayed by the company. Every employee can obtain a loan of money that may exceed his salary by from 100 to 250 per cent according to circumstances, and this loan is repaid without interest in monthly instalments in amounts that vary to from 5 to 10 per cent of the sum borrowed; the instalment can be postponed, if desired, when the quarter arrives during which rent is due.

Last, but not least, Mr. de Fodor has had issued in the name of each employee who receives a monthly salary an insurance policy which will give him a pension after he has served the company for forty years; in case of disablement or death he or his widow receives a pension immediately. To-day several widows are drawing pensions from the insurance company. In case an employee leaves the company after he has served several years, the company presents him with the policy if his conduct has been satisfactory. Obviously such a policy is a far better present than the testimonial or gold watch and chain which are often given to a man after he has served a company a lifetime. The Budapest General Electric Company pays the taxes that the state levies on the income which its employees receive from the company.

It will be seen from what is stated above that such a handling of the workmen on the part of a private concern produces not only the very best of impressions and co-operation, but brings together a staff of workers who are not only devoted to their duties but take a sincere interest in the welfare of the company by which they are employed. The company is immune from all kinds of strikes or other labor disturbances, since the men appreciate that they would lose too much, as they forfeit future privileges that gradually increase in worth the longer they remain in service.

Mr. de Fodor believes in meeting all his men from time to time personally in a social way, and hence invites them to dinners now and then where all forms of business are cast aside and all the men are placed on an equal footing in the enjoyment of the occasion.

It will be seen from the above outline of results obtained by the Budapest General Electric Company that the plan being introduced by the Union Electric Light & Power Company, St. Louis, is worthy of imitation by other concerns. It is a creditable action which should be commended by the entire press of the United States.

Budapest, Hungary. Francis Jehl.

American and European Wiring Practice

To the Editors of the Electrical World:

Sirs:—In regard to Mr. L. Lustig's letter in your issue of Feb. 15 commenting on my contribution printed in the Jan. 11 issue under the title "American and European Wiring Practice" a few words of explanation should be given. Although the title as printed may have been somewhat general, it is distinctly stated in the beginning of my article that the wiring methods described are those of French and Italian—in fact, mainly of French—practice.

I know well that a more advanced standard is adhered to in Germany and Switzerland (in both of which countries, for instance, as Mr. Lustig states, the use of wooden molding has been discontinued), but as I am mainly familiar with the systems in use in the more southern European countries, I confined myself to a description of the methods used there, beginning with the flexible-cord system mentioned in the article published on Jan. 11.

However, even in Germany, present practice in conduit work sanctions the use of asphaltic paper tube armored with sheet brass, sheet iron or sheet aluminum, with an occasional use of thin-steel threaded-joint insulated pipe where a more durable job is required. No unlined pipe similar to that used in the United States can be obtained in Germany or in any other part of the continent of Europe, nor can any stamped-steel outlet and switch boxes be had there; at least, my efforts to obtain them from German conduit manufacturers, who supply most of this material used in Europe, were unsuccessful, and I was obliged to use American conduit fittings for my work on the Riviera, notwithstanding the high cost of transportation and duty, which was almost prohibitive of their use.

Regarding the steel suspension cable, in addition to the two copper conductors, in flexible cords, which Mr. Lustig mentions as being used in Germany and Austria, I might mention that a German electrical engineer informed me recently that this is not in as general use as formerly, and that if ceiling rosettes and lamp sockets were constructed with a space for tying a good knot in the flexible cord, as is the case with American sockets, the use of a supplementary suspension strand would cease.

In conclusion, I would state that my reason for contributing the descriptions of foreign wiring methods is that, while I am convinced that prevailing American practice in conduit work—which is necessary for the best installations where permanence and reliability are prime requisites—is far in advance of European practice, yet I believe a great deal can be learned from Europe with regard to the more simple and inexpensive forms of wiring which will be necessary for the introduction of electric lighting into the cheaper grades of dwellings and apartment houses which are already built, and where there is no possibility of the tenants enjoying the advantages of electric service so long as present costly and over-standardized wiring methods are insisted upon in this country.

Brooklyn, N. Y. Albert H. Bernhard.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Locating Faults on Series Lighting Circuits

BY VERNE JAMES

Grounds on series arc or incandescent lighting circuits frequently reveal their locations automatically. If there are two good grounds on the circuit, the lamps connected in the line between the grounds will not burn because the grounds will shunt them out. For example, in Fig. 1, with a good ground at I and II, the lamps Nos. 2 and 10 would be shunted out. Sometimes there may be two grounds on a circuit, but they may not be "good" enough to shunt out the lamps.

The presence of but one ground on a circuit, irrespective of how "good" it is, will not reveal itself automatically, and the proper operation of the circuit will not be affected by one ground. However, where there is one ground it constitutes a menace to the lives of the station operators and troublemen. Furthermore, another ground may occur at any time that may cause the shunting out of lamps or possibly a fire or destruction of equipment. Hence it is very desirable to maintain the circuits entirely clear of grounds. It is the practice in all well-maintained stations to test each series circuit for grounds some time during every afternoon, and if a ground is discovered a troubleman is sent out to locate and clear it before the circuit is thrown into service for the night.

The usual method of testing dead series circuits for grounds is to disconnect the circuit from all station appa-

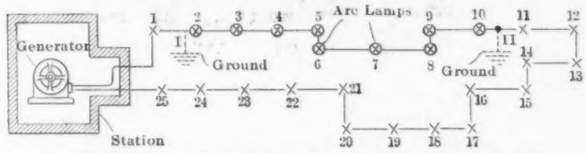


FIG. 1—EFFECT OF TWO GROUNDS ON AN ARC-LAMP CIRCUIT

ratus and then to connect one terminal of a magneto test set to the circuit and the other to ground. If the bell rings vigorously when the crank is turned, the circuit is grounded. If it does not, the circuit is clear. If the circuit is very long or in cable for a considerable portion of its length, the bell may ring even if the circuit be clear of grounds.

The method of locating a ground on a dead arc circuit is illustrated in Fig. 2. Disconnect all station apparatus and temporarily ground one side of the circuit as at *B* (Fig. 2). Proceed out along the line and connect some testing instrument (a magneto test set is most frequently used) in series with the circuit at some point. If when the crank is turned the magneto bell rings, indicating a closed circuit, the tester is between the station ground and the ground on the circuit. If the magneto "rings open," the tester is between the circuit ground and the ungrounded station end of the circuit. If, in Fig. 2, the test set is inserted at lamps 1, 2 or 3, the magneto should ring "closed," while if inserted at any of the other lamps it should ring "open."

In locating either a ground or a break on a series circuit, unless the tester has an idea as to the location of the trouble, he should proceed to the middle point of the circuit and there make his first test. This first test will indicate on which side of the middle point the trouble is. He should then proceed to the middle point of the half of the circuit that shows trouble and there make another test. This will localize the trouble to one quarter of the circuit. This "halving" of the sections of the circuit should be continued until the trouble is finally found.

A ground on a series circuit can sometimes be located with the current from the arc generator or rectifier by placing a temporary ground on the circuit at the station. For example, if in Fig. 2 a temporary ground is connected to

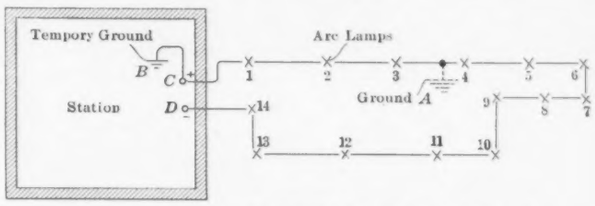


FIG. 2—LOCATING A GROUND ON A DEAD CIRCUIT

terminal *B* and the device that supplies the operating current to the circuit is connected to terminals *C* and *D* and normal operating current thrown out on the circuit, the lamps 1, 2 and 3 will not burn, indicating that the ground is between lamps 3 and 4. The use of this method is attended by some fire risk; hence the method should be used with caution.

A method of locating a ground on a series circuit with lamp bank is suggested in Fig. 3. A bank of 110-volt incandescent lamps, each of the same candle-power, is connected in series as indicated and one end of the bank is permanently grounded. There should be a sufficient number of lamps in the bank so that the sum of the voltages of all of the lamps is at least equal to the voltage impressed on the series circuit by the arc generator or the regulator. For instance, if the voltage impressed on the series circuit is 6600, there should be at least sixty 110-volt incandescent lamps in the bank.

In locating a ground the flexible cord which is connected to the center point of the double-throw switch is successively placed on different points on the conductor that connects the incandescent lamps in series, the switch being thrown to one or the other of the circuit terminals *C* or *D*. Move the flexible cord along until the incandescent lamps in the bank between the point of connection of the cord and

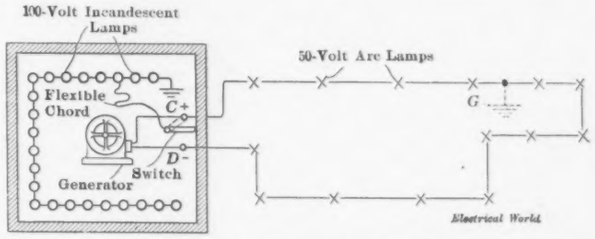


FIG. 3—USE OF LAMP BANK IN LOCATING GROUND ON ARC CIRCUIT

the permanent ground burn at about full brilliancy. When this condition obtains the voltage impressed across the lamps that are burning at full brilliance is approximately equal to the voltage impressed on the portion of the arc circuit (to which the switch connects) between the station and the ground. The voltage required across each lamp of the outside circuit being known, the number of lamps

would lose too much, as they forfeit future privileges that

between the station and the ground can be readily computed, and thereby the ground is located.

For example, consider Fig. 3. There is a ground on the circuit at *G*. It is found that two of the incandescent lamps of the bank burn at full brilliancy between the flexible cord connector and the lamp-bank ground. Since 110-volt lamps are used in the bank, the voltage across these two is 220. This means that the voltage on the arc circuit between points *C* and *G* is about 220. Since the arc lamps each require about 50 volts, there must be 220÷50=4.4, or in round numbers 4, arc lamps between *C* and the ground *G*. After making a test with the switch point on *C*, it should be thrown over to *D* and a check test made from the other end of the circuit. The method is the same in each case.

To locate a break in a series circuit, ground one end of the circuit at the station, as in Fig. 2. Then make tests at different points out on the circuit with the magneto connected in between line and ground. So long as the magneto bell indicates a closed circuit, the open is on the line side of the tester. When the magneto indicates an open circuit the open is toward the station from the tester.

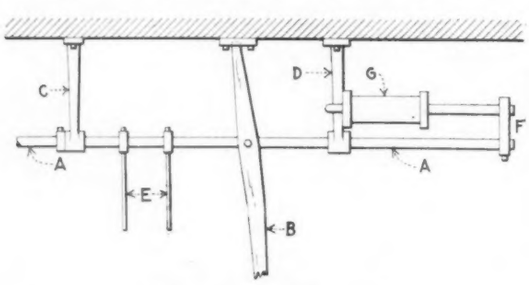
Dash-Pot Belt Shifter

By James F. Hobart

A double emery wheel driven by a 3-hp, 220-volt direct-current motor is belted to a common line shaft with a small pump and a light screw-cutting lathe. It was not intended to operate the lathe while the grinder was working, but men sometimes shift the belt of the emery grinder without looking to see whether the pump and lathe are running or not. After several recurrences of this unnecessary overload which nearly burned out the motor it was determined to put a stop to the sudden shifting of the grinder load to the small motor. To this end, an arrangement was added to the belt shifter which made it impossible to throw the belt over quickly. The operation of this device required a little of the workman's time—probably three or four seconds—but it also prevented a sudden load being thrown upon the motor.

The method shown in the drawing insures a slow, steady movement to the belt shifter. The sliding bar of the overhead hanger is shown at *AA*, the shifter-handle at *B*, the shifter hangers at *CD*, and the belt fork at *E*. One end of bar *A* was extended to the right to receive the double collar *F*. To the hanger *D* was clamped a portion of a door check which was found among the scrap metal. The spring was dispensed with, and only the cylinder, rod and piston were retained. The piston rod was attached to bar *A* by means of the double collar *F*.

This apparatus, although very simple, has given satisfac-



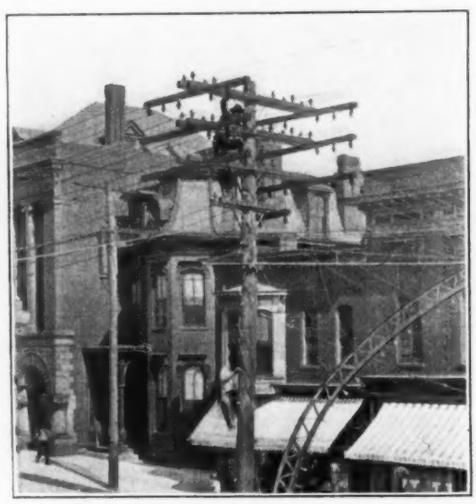
HOME-MADE BELT-SHIFTER

tory service. When a man tries to move the belt shifter in a hurry it will not go, and the hiss of escaping air from the door check reminds him that he is moving the belt shifter faster than he should. The adjusting screw, which is part of each door check, permits the apparatus to be set so that it will move at any required speed. When the belt is to be shifted in the reverse direction air passes through the piston freely and offers no appreciable resistance to movement of the belt shifter. The workman may shut off the grinder as quickly as he pleases, but must start it slowly.

Wire Clearance with Buck-Arm Construction

The method of buck-arm construction of junction poles employed at Fairmont, W. Va., is illustrated in the accompanying reproduction. Double arms are used for the main leads, buck-arms being fixed to each end of the double arms by through-bolts. The pins in the buck-arms are mounted on the under side in order to give good clearance. These inverted insulators are then filled with tar cement to keep out water. All cross-arms used on the local lighting system are of Washington fir and are previously soaked in dead oil of coal tar for nearly one month.

This buck-arm construction, according to Mr. D. L. Evans, line superintendent of the Fairmont & Clarksburg Traction Company, gives good clearance for linemen and makes it cheaper to renew arms when required. With the cross-arm construction formerly employed at this location it was impossible for linemen to get up between the wires to the top of pole.



BUCK-ARM CONSTRUCTION AT FAIRMONT, W. VA.

Adjustment of Exciter Voltage

The field of an alternator is supplied with energy from a 1.5-kw, 110-volt shunt-wound exciter. One rheostat is connected in the field circuit of the exciter and another is inserted between the exciter armature and the field circuit of the alternator. Should the exciter be worked at full rated voltage with regulation by the alternator field-circuit rheostat, or should the regulation preferably come in part from the exciter field-circuit rheostat? The present load does not require the use of both. If the exciter is worked at low voltage output, it operates at poor efficiency, while if worked at full voltage, energy will be wasted in the alternator field resistance. F. E. S.

In supplying excitation current to any alternator the best arrangement will be one, of course, in which the losses become a minimum. Therefore the field coils of the alternator should be used without extra resistance and the voltage of the small exciting generator should be kept at a value just large enough to supply the required amount of current to the field coils of the alternator. In some cases such a voltage might be too low on account of the tendency of the direct-current generator to fluctuate too widely in voltage with slight changes in speed. If this condition exists in your station, it would be better to operate the exciter generator at a slightly higher voltage and to make use of a small amount of resistance in series with the field coils of the alternators.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Parallel Operation.—In connection with the parallel operation of alternators it is well known that serious trouble from hunting may occur unless the system has such characteristics as to prevent the natural oscillating frequency from approaching resonance with the frequency of the engine impulses. The author discusses formulas for determining the natural frequency from the alternator characteristics and the weight of flywheel needed to give the system a predetermined natural frequency. The results of actual practice sometimes differ seriously from those indicated by the formulas. The author discusses the importance of the corrections which must be applied and shows how to apply them. Notes are added upon the effect of load, the calculation of combinations of dissimilar sets, and the general specification of requirements to be met by the flywheel. —London *Electrician*, Feb. 14, 1913.

Sparkless Commutation of a Rotary Converter Mechanically Coupled to an Alternating-Current Booster.—A note on a recent British patent (No. 23,285, 1912) of the Siemens-Schuckert company. The compensating windings are energized by a current varying with the load on the booster, as well as by the direct current from the converter. This extra exciting current may be derived from extra brushes on an auxiliary commutator on the booster and lying in the direction of the main poles; auxiliary poles midway between the main poles are energized by the direct current from the converter. Auxiliary windings on the booster armature may be used, or else an auxiliary dynamo with constant field driven by a direct-current motor whose armature is connected to the field coils of the booster. These two machines may be combined into one, having two commutators and operating in conjunction with fields of different numbers of poles.—London *Elec. Eng'ing*, Feb. 6, 1913.

Speed Control of Cascade Induction Motors.—A note on a recent (British) patent (No. 1979, 1912) of E. Rosenberg. The rotor of the first motor is connected to a starting resistor through the stator of the second motor, which has a short-circuiting switch whereby the resistor can be connected directly to the rotor of the first motor. Mechanically connected to the short-circuiting switch is a pole-changing switch. The resistance is always connected to the rotor of the first motor.—London *Elec. Eng'ing*, Feb. 13, 1913.

Excitation of Direct-Current Machines.—E. J. Brunswick.—A long mathematical paper illustrated by diagrams and read before the International Society of Electricians in Paris. After reviewing the known methods for predetermining the excitation of direct-current machines the author gives a new method which is specially intended for practical use.—*La Revue Elec.*, Feb. 7, 1913.

Commutation.—A. Manduit.—The first part of a paper illustrated by diagrams and read before the International Society of Electricians in Paris. The author gives an account of experimental and theoretical researches on commutation in direct-current machines.—*La Revue Elec.*, Feb. 7, 1913.

Resistance of Contacts.—L. Binder.—An illustrated translation of his recent German article on the resistance of such contacts as are formed by brushes on slip-rings and commutators.—London *Electrician*, Feb. 14, 1913.

High Angular Speeds.—Maurice Leblanc.—The conclusion of his long paper on the realization of high angular speeds. In this instalment the author outlines his methods of automatically maintaining the equilibrium.—*La Revue Elec.*, Feb. 7, 1913.

Lamps and Lighting

Chemical Production of Light.—Wilder D. Bancroft.—A Franklin Institute paper in which the author shows that photoluminescence, thermoluminescence, pyroluminescence, electroluminescence, cathodoluminescence, anodoluminescence, crystalloluminescence, triboluminescence and organoluminescence are all cases of chemiluminescence, or luminescence due to and accompanied by chemical action. In some cases of cathodoluminescence it is possible to give the chemical reactions taking place. One should speak of the spectrum of a reaction and not of the spectrum of a substance. Any marked change in a spectrum indicates the occurrence of another reaction. The same bluish light is emitted when sodium burns slowly in chlorine, when sodium chloride is fused, when sodium chloride is placed in the surface separating the oxidizing and the reducing zones of the Bunsen flame, when hydrochloric acid gas is fed into a sodium flame, when sodium chloride is precipitated from an aqueous solution by alcohol or by hydrochloric acid, and when sodium crystals are crushed. All reactions tend to emit light, and all reactions do emit light if the reaction velocity is sufficiently high. The critical reaction velocity necessary to the emission of light visible to the eye may be very different with two different reactions. The intensity of the emitted light increases with increasing reaction velocity. The quality of the emitted light varies only slightly with the reaction velocity.—*Jour. Franklin Inst.*, February, 1913.

Generation, Transmission and Distribution

Powdered Coal as Fuel.—H. R. Barnhurst.—An illustrated article discussing concisely the specific requirements for the use of powdered coal as fuel, namely, dry coal, fine grinding, hot chamber or firebox, and proper air supply. The quality of the coal is not of supreme importance with this method. Its great value in the developments of the future may be in the efficiencies obtainable from low-class or refractory fuels heretofore unavailable.—*Metall. and Chem. Eng'ing*, March, 1913.

Water-Power Development by the Prussian State.—An account of a bill before the parliament of Prussia proposing the development of water-powers of the Weser River by the Prussian state in connection with the canal system of Prussia. It is proposed to build three power stations which will be able to develop 41,000,000 kw-hr. per year. This energy is to be distributed over the surrounding district, which includes the cities of Göttingen, Münden, Cassel and Waldeck. Some details of the plan of the stations are given.—*Elek. Zeit.*, Feb. 13, 1913.

Dangerous Rise of Voltage.—W. Petersen.—The first part of a paper in which the author discusses the general subject of dangerous rises of voltages in networks and protection of the networks. He points out that the object of the protective apparatus should be the prevention of dangerous rises of voltages. The network must be so designed that quantities of energy cannot be transferred to portions of the network of limited extension. It is wrong to compare the network with a circuit having a single inductance and single capacity, as it is a circuit with distributed inductance and capacity, and the dangerous rises of voltages

belt is to be shifted in the reverse direction air passes the alternators.

must be explained by the theory of waves traveling along circuits of this kind. The author outlines the theory of traveling waves. The article is to be continued.—*Elek. Zeit.*, Feb. 13, 1913.

Starting Squirrel-Cage Induction Motors.—C. MACMILLEN.—An article giving a comparison of three methods of starting squirrel-cage induction motors, by means of an auto-transformer, a balanced rheostat or an unbalanced rheostat. The relative magnitude of the disturbances produced on the distribution system by any one of these three methods is analyzed. Since the balanced rheostat permits the terminal voltage on the motor to rise as the current decreases with increase of speed, while the auto-transformer maintains practically a constant voltage during acceleration, the rheostat might appear to give the more desirable results, but a consideration of the starting characteristics of the induction motor shows these advantages to be largely superficial. From a number of tests, the results of which are plotted in curves, it was found that the auto-transformer gives the most satisfactory starting conditions, both as regards the amount of current necessary for a given value of torque and the actual power taken from the line.—*Gen. Elec. Rev.*, March, 1913.

Electric Power in Breweries.—G. BACHMANN.—The first part of an illustrated article on the use of electricity in breweries. In case energy is bought from a transmission system three-phase current may be used, but if the brewery has its own generating plant, direct current is far preferable. The three-wire direct-current system of 2×110 volts is recommended with the lamps operated at 110 volts and the motors connected across the outer wires. Individual motor drive is preferable to group drive. The drive of the various machines used in breweries is discussed. The article is to be concluded.—*Elek. Zeit.*, Feb. 13, 1913.

Explosion-Proof Motors.—H. H. CLARK.—The author discusses the theory of explosion-proof protection; the method of testing is explained, and the types of device tested are described. The test results are discussed for each type and a general review of the whole is given, with some conclusions as to design deduced from the tests.—London *Electrician*, Feb. 14, 1913.

Traction

Tramways in Industrial District.—G. PETRI.—An article giving a review of the system of tramways and light railways in the Bergischeland, including the textile industry of the Wuppertal and the steel industry of Solingen. It is a district of 1100 sq. km with 411 km of light railways. The different lines are all operated by the trolley system, although in other respects the equipment is quite different. Direct current is used at voltages varying between 500 and 750.—*Elek. Zeit.*, Feb. 13, 1913.

Railway Electrification.—Some notes on the extensive electrification scheme which the North Eastern Railway in Great Britain has under consideration, on the high-tension, direct-current system. From a power station three-phase currents at a frequency of 40 cycles will be transmitted at 20,000 volts to two substations situated on the railway and there converted to direct current at 1500 volts. The ordinary track rails will be bonded for the return circuit, and at places where overhead equipment is difficult a protected conductor rail will be erected on the track sleepers.—London *Electrician*, Feb. 14, 1913.

Installations, Systems and Appliances

Control of Meters, Public Lamps, Etc., from the Central Station.—W. DUDDELL, A. H. DYKES AND H. W. HANDCOCK.—A paper read before the (British) Institution of Electrical Engineers. The author describes a new method of remote control. The underlying principle is to control relays, which may be inserted anywhere on the general system of mains, by means of a superposed current impressed on the main current in the system. If the main current be continuous, then the control current may be alternating of any desired frequency. If the main current be alternating, then the impressed current must be of a different frequency, the relay in either case being so designed that while it instantly responds to the impressed current it is unaffected by any alteration of the main current or pressure. In the case of an alternating-current system one may superpose a direct current—that is, move the zero line of the wave-

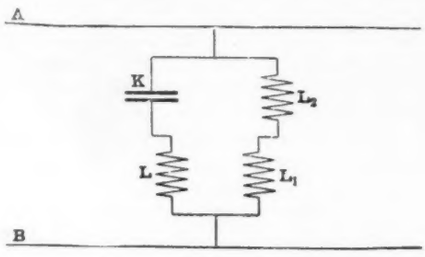


FIG. 1—COMPENSATED RELAY CIRCUIT

form a little away from the symmetrical position. Obviously the addition of a small alternating-current emf of, say, 10 volts, will not affect the lamps on the mains. The chief problem is the design of a reliable relay. On a direct-current system the solution is as follows: A condenser and a coil, to be used as a relay, are connected in series across the mains. This will not be affected by the continuous current, but will respond to an alternating current. On an alternating-current system the relay must be made "selective" so that it will operate only when a current of the selected frequency is impressed on the line. This can be done by making use of the phenomenon of resonance. The authors so choose the self-induction of the relay L and the capacity of the condenser K that at the frequency F', at which the relay is intended to operate, they are in resonance, while at the normal frequency F they are not. That is to say, neglecting resistance, the following relation is established: $LK(2\pi F')^2 = 1$. This simple resonance circuit works perfectly in the case of a direct-current supply system and has many advantages over the non-resonant relay; but in the case of an alternating-current supply, unless the resonance be made unduly sharp or there be a large difference between frequencies, the condenser K and relay L will let through sufficient current at the lower or supply frequency to attract the armature of the relay. For instance, with a supply circuit of 100 volts at 50 cycles it seems impracticable to build commercially a plain resonance relay to work with 5 volts superposed. To get over this difficulty the authors add an additional or compensating circuit to the relay, as illustrated in Fig. 1. L is the relay coil, the armature and core being omitted for the sake of clearness. On top of this coil is wound a

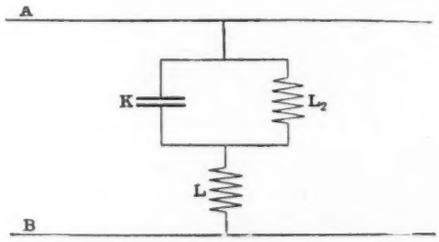


FIG. 2—SIMILAR CIRCUIT FOR COMPENSATED RELAY

second coil L_1, which may have roughly the same number of turns, and this coil is connected in series with a choking coil L_2, having a high self-induction. The current through the condenser K and relay coil due to the supply frequency, say, 50, leads almost 90 deg. the applied potential difference. The current through the choking coil L_2 and compensating winding L_1 is made to lag about 90 deg.

If these two currents be adjusted to approximate equality, their action on the core of the relay can be made very small. It cannot be completely eliminated, because the two currents are not exactly at 180 deg. to one another, but it is sufficient for practical purposes. By making the choking coil L_2 with an adjustable air-gap in its magnetic circuit it is very easy to adjust the compensation. A compensated

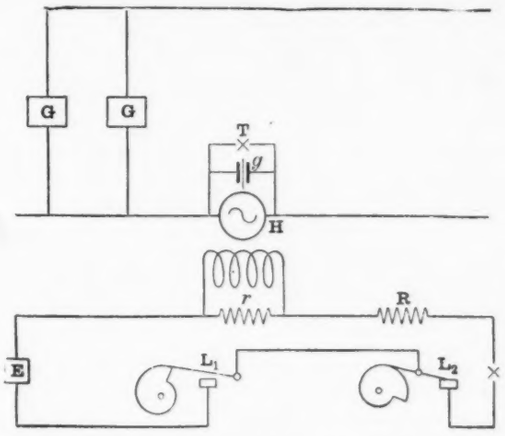


FIG. 3—CONNECTIONS OF RIPPLE GENERATOR

resonance relay of this sort will work with certainty at 5 volts, 200 cycles, and will consume zero volts at 50 cycles. The arrangement in Fig. 2, although electrically identical with that in Fig. 1, may be looked upon as functioning in a different way. Owing to the supply pressure a certain current flows at the lower frequency through the condenser K. The greater part of this current may be supplied without taking it from the mains by placing a choking coil in parallel and adjusting the choke coil so that its self-induction and the capacity of the condenser are practically in resonance for the supply frequency. In this case the only current taken from the supply mains is the small current to supply the losses, and this small current is the only current due to the supply frequency, which flows through the relay coil L. At the high frequency of the superposed current, K and L_2 are no longer in resonance, and consequently a considerable current will flow through K and L, which may be further enhanced by making K and L also in resonance. To superpose the ripple on the supply an alternator or the secondary of a transformer can be put in series with the main generators. The connections of the ripple generator are shown in Fig. 3. In this diagram G, G are the main generators and H the high-frequency alternator to supply the ripple, the whole of the main current passing through H when in use. E is the exciter, R a regulating resistor, T a short-circuiting switch, and G is a spark-gap to prevent an interruption of the main current if H should break down. The two cams are mounted on one shaft and rotate together. They can be adjusted to give any length of contact desired. The relays on an alternating-current system being always connected across the mains absorb a little power, but this is more than counterbalanced by the saving in meter-shunt losses due to the shunts being cut out of circuit. In a direct-current system the relays consume no energy, except when the ripple is on, when the loss is 0.7 watt per relay. For ordinary incandescent street lighting a relay is fixed in the base of the lamp-post, operating a switch by a step-by-step movement. On switching on the high-frequency current the armature of the relay is attracted and then released, causing the switch to be released. When next the current is switched on, the armature is again attracted and released, causing the switch to open. In the case of the larger switches for motors, transformers, etc., the relay closes or opens the circuit of a local solenoid operated directly off the mains.—London *Electrician*, Feb. 17, 1913.

Electrophysics and Magnetism

Electric Resistivity of Metals in a Wide Range of Temperature.—E. F. Northrup and V. A. Suydan.—A paper giving a preliminary report of an extended investigation which had a twofold object: First, to perfect a method whereby the resistivities of metals and alloys may be measured with ease, precision and rapidity through a range of temperature between that of liquid air and a point a little below the boiling point of the substance in question; the same method to be applicable to molten salts. Second, to use this method for obtaining data on metals, alloys and molten salts which boil under 1500 deg. C., for plotting sets of curves showing the resistivity and temperature over a range of temperature of from 20 deg. C. to near the boiling point of the substance in question. In this paper the results are given for the following metals: mercury, lead, cadmium, zinc, tin, bismuth and antimony, at different temperatures between 200 deg. and 900 deg. C.—*Jour. Franklin Inst.*, February, 1913.

Form-Factor of Waves.—Taylor Read.—The sine wave is the form recognized as standard by the A. I. E. E., and in its Standardization Rules limits are set for the allowable deviation from the equivalent sine wave of peaked and flat-top waves. The effective values of voltage or current as read on indicating instruments do not give a correct representation of the average, or mean, values. Some important engineering factors depend upon the average values. For instance, the flux density and consequent hysteresis loss and heating in transformer cores is a function of the average voltage, not of the effective, and for a given voltmeter reading may be too low if tested on a peaked wave. Hence the necessity for keeping within certain well-defined limits. In this article the author has calculated and plotted the limiting peaked and flat-top waves that comply with the above-mentioned rules.—*Gen. Elec. Rev.*, March, 1913.

Electrochemistry and Batteries

Cheaper Alumina.—A symposium of papers on methods for producing cheaper alumina. If any of these methods prove successful, it will have a great effect on the price of aluminum, as at present the controlling factor is the cost of the starting material, the alumina. Two papers, by J. W. Richards and Sam A. Tucker, deal with the Serpek process, in which alumina and ammonia are produced simultaneously, this process being also one for the fixation of atmospheric nitrogen. A paper by A. H. Cowles describes his new process for producing alumina and numerous by-products from mineral silicates and deals with recent advances made at the plant at Sewaren. A paper by L. E. Saunders deals with the uses of aluminum as an abrasive and refractory. —*Metall. and Chem. Eng'ing*, March, 1913.

Units, Measurements and Instruments

Variations of the Loading-Back Test.—F. S. Robertson and R. E. Shawcross.—The difficulty with the original Hopkinson method of testing two machines and Kapp's modification is the difference in the fields of the two machines. The later variations are improvements in this respect, the magnet windings being adjusted so as to have equal ampere-turns. Special attention was paid to this matter by Field, who by putting the magnet windings in series produced practically identical field strengths. Modern machines with commutating poles do not appear, however, to give this desirable effect. From tests the present writers carried out on two tramway motors, fitted with commutating poles, they found that the fields were very dissimilar on load when the magnet ampere-turns were equal, and that the generator magnet windings had to be shunted to a considerable extent in order to bring the emfs, and therefore the field strengths, into equality. The author gives the results of tests first with the field windings in series and secondly with the generator field shunted as in Fig. 4. In the first case the emfs of the motor and the

generator were 440.8 and 467.6 volts respectively. In the second case they were 435.2 and 436.2. If the object of the test is merely to determine the efficiency of the machines, then, as pointed out by Hopkinson, a considerable error in the energy supplied will only slightly affect the result. The test is, however, capable of giving accurate information on the core loss under load. In this case it is necessary to take every precaution to keep the fields equal to insure equal core loss in the two machines. The total friction and core loss is most readily obtained as a contribution from the mains iE_m and one from the booster $I(E_m - E_g)$. This later vanishes when the fields are truly equal, and may become negative as in the tests before mentioned.—London *Electrician*, Feb. 14, 1913.

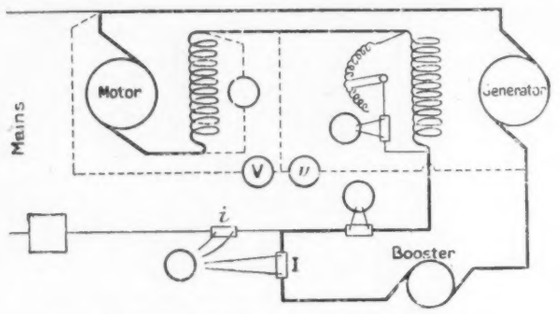


FIG. 4—CONNECTIONS FOR LOADING-BACK TEST

Testing Insulation.—M. E. Tressler.—An article illustrated by diagrams on methods of testing electric insulating materials. Methods of measuring insulation resistance and disruptive strength are described, followed by a discussion of the effect on disruptive voltage of such factors as thickness of insulation, size and shape of insulating material, temperature, time of application of voltage, and frequency. Permissivity is defined, means of its measurement described, and its values for common insulating materials given. The concluding section deals with energy losses in insulation.—*Gen. Elec. Rev.*, March, 1913.

Resistance Measurements.—In a continuation of the serial on shop testing of electrical apparatus the various methods for measuring resistances are reviewed.—*Elec. Jour.*, February, 1913.

Telegraphy, Telephony and Signals

Disturbances of Telephone Lines Due to Three-Phase Transmission Lines.—O. Brauns.—A conclusion of his long article. The author gives a long series of oscillograms. His final conclusion is that three-phase lines produce in adjoining telephone lines disturbances due to influence and induction. The higher harmonics of the voltage and the current waves in the three-phase line are much more important in this respect than the fundamental wave. In star-connected systems the triple higher harmonics are the chief disturbing factors if the neutral point of the generator is earthed. In this case dangerous voltages may be produced by induction in the telephone line. This is confirmed by the oscillograms taken in the high-tension district of the Eberswald electricity station. For this reason the earthing of the neutral point of the generator is disadvantageous.—*Elek. Zeit.*, Feb. 13, 1913.

Signaling Thunderstorms.—An illustrated description of the storm indicator of the Telefunken company. A spark-gap *F* and a coil *S* connected up to the earth conductor *E* are inserted into the aerial wire *L*, as shown in Fig. 5. The coherer *Fr* and a blocking condenser *C* are arranged in parallel with the coil, the relay circuit, which comprises the cell and the relay coils *Sr*, being branched off, as usual, from the condenser. The secondary circuit of the relay contains a battery *B*, which, when the relay contact is completed, actuates a tapper *K* and a recording apparatus (in the present case a single-stroke bell *G*). The spark-gap having been adjusted to a spark distance of a few tenths of a millimeter, a series of sparks will pass, thus exciting the coherer and sounding the bell as soon as there are any changing phenomena in the atmosphere. Feeble atmospheric accumulations—that is to say, far distant thunderstorms—will result in a slow charging of the aerial wire, and accordingly in the passage of sparks at considerable intervals. Since the signal bell is sounded in the very rhythm of spark discharges, the sequence of sound allows the distance of the thunderstorm from the recording apparatus to be gaged. In the place of the single-stroke bell, a Morse recorder with self-disengaging paper tape can be connected up to the apparatus, thus marking each passage of a spark by a point on the tape. If the speed at which the paper is unwound be known, the distance of the thunderstorm can be gaged by measuring up the paper tape and counting the number of points recorded thereon.—London *Elec. Review*, Feb. 14, 1913.

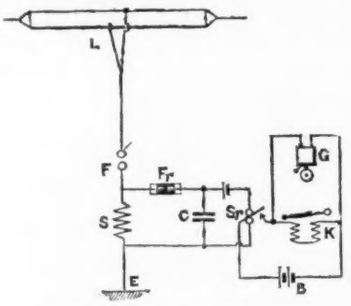


FIG. 5—CONNECTIONS FOR STORM INDICATOR

Book Reviews

Wechselstromtechnik. By Dr. G. Roessler. Part I. Berlin, Germany: Julius Springer. 304 pages. 185 illus. Price, 9 marks.

Dr. Roessler's writings have always interested the electrical engineer. The author is a man of great erudition and is possessed of the pedagogic faculty of presenting a complex subject in a thoroughly scientific manner with the utmost clearness and lucidity. The book treats, first, of general definitions; second, of general principles; third, of alternating-current transformers; fourth, of generators for single-phase and polyphase currents; fifth, of polyphase currents and rotating fields; sixth, of non-synchronous polyphase motors without commutators. It can be heartily recommended to students who are familiar with the German language and who wish to study a most readable elementary treatise.

Allgemeine Elektrotechnik Hochschul-Vorlesungen. By P. Janet. Vol. I. Leipzig, Germany: B. G. Teubner. 280 pages, illus. Price, 7 marks.

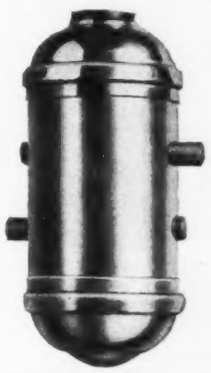
This book is a German translation of Prof. Paul Janet's work. It is rather difficult to do justice in a review to a book of this nature which to the reviewer has passed through a double translation. As a class book for students of elementary electricity it seems interesting and suggestive. In reviewing a book of this character by a French author one can never help indulging in a comparison between it and the master treatise of Mascart and Joubert, which is so well known and clear. There can be no question that M. Janet's book in its translation will be of great interest to German readers, but it can hardly be expected that the American reader will take the trouble to study the German translation while the French original is accessible.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Two-Circuit Pendent Switch

For controlling two circuits, two chandeliers, two clusters or lamps and a fan from one location a two-circuit arrangement is the most convenient. A porcelain-type, brass-shell two-circuit pendant has been added by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., to its standard line of supplies. The small quick-break twin mechanisms are inclosed in the base, each mechanism being operated by its own push-bar. The switch is rated at 6 amp, 125 volts, or 3 amp, 250 volts.



PENDENT SWITCH FOR TWO-CIRCUIT CONTROL

By means of this switch a large chandelier or cluster of lamps may be divided into two groups controlled separately, as is often done in large stores where some artificial lighting is desired during daytime. Also for fan electroliers where the fan and lamps may be used at different times, the two-circuit pendant affords convenient control. Various other combinations in which it will be found useful will readily suggest themselves. The switch has been approved by the Underwriters' Laboratories.

An Electric Flashlight "Pistol"

An electric-flashlight "pistol," which is a close copy of a small Colt automatic revolver, has been brought out by the Interstate Electric Novelty Company, of New York. The case, which is made of stamped metal with gun-metal finish, is 4 in. long. Complete with lamp and battery the whole device weighs only 4 ounces. In the muzzle of the toy gun is a miniature tungsten lamp, which is supplied with electricity from a small battery located in the handle of the pistol. The switch controlling the lamp is operated by pressing the trigger. A continuous light may be obtained by sliding a button which locks the trigger. The top of the magazine is removable, allowing for replacement of the battery, which merely slides into place without the necessity of connecting any wires. This harmless novelty, besides being useful in looking for street numbers and keyholes, may serve in some measure as a protection, particularly for women and children, as it looks very much like a real weapon.

TOY PISTOL CONTAINING TUNGSTEN LAMP

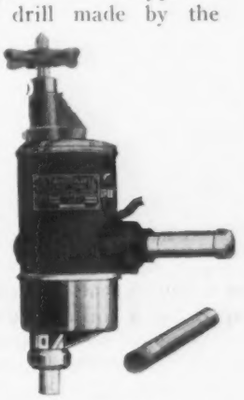
Physician's Electric Centrifuge

The illustration presented herewith shows a physician's electric centrifuge which is being introduced by the Lindstrom, Smith Company, 281 South Wabash Avenue, Chicago, Ill. It is claimed that this outfit covers the entire centrifugal field in so far as it relates to therapeutic work. The machine is equipped with two aluminum tube shields and two glass tubes, one of which is graduated and the other plain. It is claimed that this apparatus permits the estimation of albumen, chlorides, phosphates and sulphates or precipitates, casts, crystals and the like in about one and one-half minutes. It will precipitate bacilli in sputum or will give the correct percentage of blood corpuscles in two minutes. The motor is capable of a high speed and is so finely adjusted that it is not necessary to have the apparatus fastened in position. The motor will operate smoothly at any speed between 1000 and 5000 r.p.m. The acceleration and deceleration are gradual to avoid any possible loss of the contents of the tubes which might be brought about owing to a sudden jerk on starting or stopping.

CENTRIFUGAL MACHINE FOR MEDICINAL USE

Electric Drills for Direct-Current and Alternating-Current Service

The accompanying illustration represents the type of high-power ⅞-in. portable electric drill made by the Standard Electric Tool Company, of Cincinnati, Ohio, for both direct-current and alternating-current operation, the latter either for two-phase or three-phase. As will be seen, the tool illustrated is fitted with screw feed. The drills are made in ¼-in., 5/16-in., ⅜-in., ½-in., ⅝-in., ¾-in. and ⅞-in. sizes. Ball bearings are used throughout and rigid construction and high power are special features. Series motors are employed on all direct-current types. The mechanical construction is simple, and it is said that these drills are "fool-proof." Motors having ample overload range are provided and are guaranteed not to run hot under the hardest continuous service. This drill is similar in many respects to the tool described in the Jan. 11, 1913, issue of the *Electrical World*.



PORTABLE ELECTRIC DRILL

Safety Cut-Out Tungsten Hanger for Industrial Use

By means of the safety cut-out hanger illustrated herewith large multiple tungsten lighting units used for industrial illumination may be automatically cut out of circuit and lowered to the ground for cleaning, trimming or renewing. The device, which is manufactured by the Thompson Electric Company, 337 Superior Avenue, N. W., Cleveland, Ohio, is similar in principle and operation to the larger arc-lamp hanger made by the same company.

SAFETY CUT-OUT HANGER FOR TUNGSTEN LAMP

As the illustration shows, the sheave arrangement effects the positive alignment of the contacts, while perfect connection is assured by the construction, which spreads the contacts by the weight of the lamp. These contacts are wiped clean each time the lamp is lowered. The hanger contains no delicate or complicated parts, and all mechanism is fully protected against dirt and weather by an inclosing metal sleeve.

For use in mills, factories, railway shops and sheds, and industrial plants of all kinds, the hanger makes it possible to clean and renew lamps from the ground, without danger of the trimmer's falling. Hanging loops of wire are avoided, and the trimmer runs no risk of shock, for the lamp is disconnected when lowered. Cranes or ladders are not needed, and the work is done in half the time otherwise required. Lamps can be located wherever most effective, without regard to accessibility, for this is assured by the hanger in any position. The hanger has the approval of the National Board of Underwriters.

Motor Drive in Pattern Works

The pattern works of Charles Jurack, Milwaukee, Wis., have recently been equipped for electric motor drive by the Mechanical Appliance Company of Milwaukee. There is a total of twenty-two machines operated by ten motors, seven of the motors being used for individual drive, while the other three drive groups of machines. One motor driving a circular saw is mounted on the floor within a wooden inclosure. Two motors operating band saws are hung on brackets on the floor below and all other motors are mounted on brackets 11 ft. above the floor. The accompanying table gives a list of the motors employed and their application. It will be noted that the 16-in. jointer and the 24-in. planer, each rated at 7.5 hp, and the group consisting of drill press, slotter, two speed lathes, 8-ft. post lathe and 12-ft. post lathe are driven by 3-hp motors, all the machines not being used at the same time.

Number of Motors	Rating in Hp	Speed, R.P.M.	Application
1	1	1,800	Belted to 6-in. jointer.
1	3	1,800	Belted to 12-in. jointer.
1	3	1,800	Belted to 16-in. jointer.
2	2	1,800	Belted by short belt to band saws.
1	3	1,800	Belted by short belt to 16-in. circular saw.
1	3	1,800	Belted to 24-in. planer.
1	3	1,800	Belted to 16-ft. line shaft, driving two speed lathes, one drill press, two post lathes and one slotter.
1	3	1,800	Belted to 12-ft. line shaft, driving four wood speed lathes and one emery wheel.
1	3	1,800	Belted to 16-ft. line shaft, driving a double-disk grinder, one fan, one core box machine and one gear cutter.

MOTOR-DRIVEN PLANER

The wiring in this plant is mostly open knob and tube work, except between motors and starting switches, where iron conduit is used with a condulet fitting at each end. Watson three-phase, 220-volt squirrel-cage motors are used. The average energy consumption per month is about 1500 kw-hr.

Semi-Indirect Lighting Fixture

The so-called "Brascolite luminous unit" is a semi-indirect lighting fixture constructed almost entirely of glass. The canopy or reflector is made of dense white opal glass depolished on the outside. The suspended bowl is made of "Alba" glass which is said to have excellent diffusing qualities and very little absorption. A tripod in the reflector for attachment to the ceiling is of cast malleable iron, to which is attached a porcelain flexible-tongue, center-contact socket. The loops below the reflector are of cast brass and screwed into the tripod, thereby carrying the bowl independently of the reflector. The three aluminum chains have hooks on the lower end so that the bowl

FIXTURE FOR SEMI-INDIRECT LIGHTING

can be easily removed for cleaning and replacing of the lamp. The tripod makes it possible to install the unit to a spud or to the side holes in the standard 4-in. junction box, or to use wood screws. Insulating joints or canopy insulators are not required, as the building wires are connected directly to the brass terminals of the sockets and the reflector is a non-conductor. The socket is placed high in the reflector to obscure the skirt of the lamp. The unit is made in four sizes: For 60-watt or 100-watt lamp, 12-in. diameter reflector; for 150-watt lamp, 14-in. diameter reflector; for 250-watt lamp, 18-in. diameter reflector; for 400-watt or 500-watt lamp, 22-in. diameter reflector.

A photometric test made in a typical office room with the 150-watt unit indicated an average of 3.5 ft.-candles at a 30-in. plane. The fixture is said to be non-corrosive and to retain its efficiency indefinitely. It is made by the St. Louis Brass Manufacturing Company, Jefferson and Washington Avenues, St. Louis, Mo.

Portable Ozonizer

The ozonizer shown herewith consists of a step-up transformer, tubes for generating the ozone and a regulating switch, all contained in a portable case. The tubes are of glass with an outer coating of metal. The inner walls are lined with a metal mesh. The outer coating is connected to one terminal of the high-tension winding of the transformer, and the inner coating is connected to the other high-tension terminal. The uneven distribution of potential by the metal mesh on the inside of the tubes produces many small brush discharges which generate ozone.

The generating cylinders are placed above the transformer and are vertical, so that the warm air rising from the transformer and from the inside of the generating tubes causes an upward draft. On top of the case is a knob connected to the regulating switch inside the case, which is connected to the generating tubes in such a manner that by turning the knob to the positions indicated on the dial the number of tubes in operation may be regulated from one to four.

The cylindrical part of the case is of heavy sheet metal and the top and bottom of wood. This wood is thoroughly seasoned and heavy enough to prevent warping. It is finished in either white enamel or polished mahogany for the wooden parts and dull black for the remainder of the case.

OZONIZER FOR GENERAL USE

The ozonizer is designed for connection directly to a lamp socket and takes only 18 watts at maximum production. The operation is practically noiseless, so that it can be left running in the sleeping room without disturbance. Although the voltage is stepped to a high value, the circuits are so thoroughly insulated and all exposed metal parts are electrically so connected together that no difference of potential can exist between them even if a part of the circuit should become grounded to the case. This ozonizer is made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Small Refrigerating Machine

A small refrigerating equipment known as the Audiffren-Singrun machine is being imported into this country from France and placed on the market by the H. W. Johns-Manville Company, New York.

The machine is of notably simple construction and can be operated by any one without any knowledge of the machine proper. It is claimed that all that is required is to close and open the switch, the unit being self-contained and practically fool-proof. It is operated on the compression system using sulphur dioxide as the refrigerating agent. Externally the machine is similar to a large dumbbell consisting of two drums or globes on a hollow shaft. When these drums are revolved the machinery within is set in motion, producing the cooling effect. There are no joints, valves, gages or stuffing boxes requiring attention. The machine is delivered complete and hermetically sealed ready to place on bearings and started. Advantages claimed for this machine are the small quantity of condensing water required and its ability to operate with much warmer condensing water than other machines. The space required is very small, an important consideration particularly in private houses, apartments, clubs, cafés, etc.

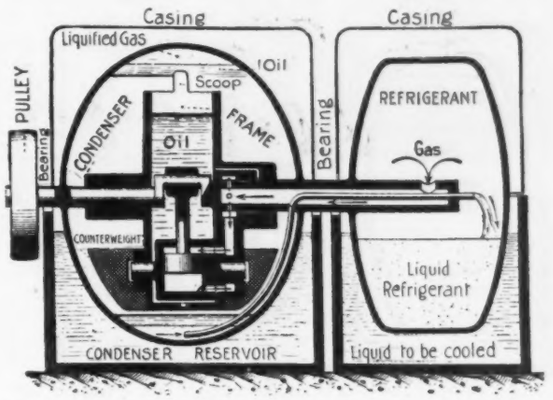


FIG. 1—SECTIONAL VIEW OF REFRIGERATING MACHINE

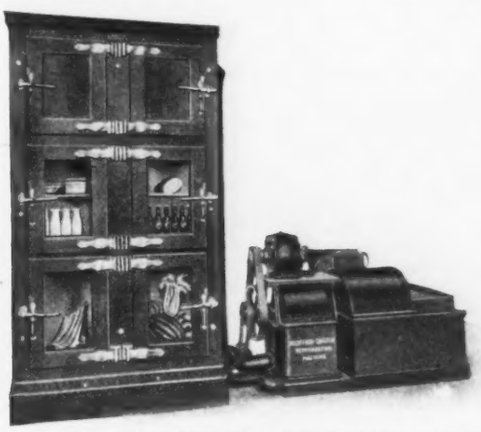
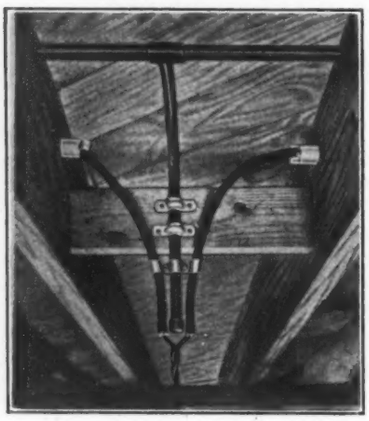


FIG. 2—REFRIGERATOR AND COOLING PLANT

Clamp for Gas and Electric Outlets

A clamp for holding electric wiring and gas pipes in position at outlets has been placed on the market by the T. & W. Manufacturing Company, Milwaukee, Wis. Nails and staples bent over looms have proved unsafe as they generally damage the insulating quality of the material. The old method of binding the looms to the pipe outlets with friction tape does not produce a good mechanical result. It is stated that with clamps of the type illustrated neither of these difficulties is encountered. The clamp is punched from strap steel and is rounded at the edges to eliminate the possible danger of cutting the loom should it be necessary to bend it at an angle with the clamp. These clamps are made for gas outlets alone, for electric outlets, or for combination gas and electric outlets. The illustration presented herewith shows a combination gas and electric outlet installed with these clamps.



OUTLET CLAMPS INSTALLED

Belt Clamp

For placing new belts and to facilitate quick lacing a belt clamp of unusual design has been put on the market by the Higgins Machinery Company, Seattle, Wash. The clamp consists of two arms in V-shaped arrangement, provided at the upper ends with clamps to be tightened on to the belt ends. Between the two arms is a toothed segment, which is engaged by a ratchet wheel turned by means of a crank. This when turned draws together the ends of the belt. It is claimed that by means of this device a belt can be made ready for lacing in three minutes.

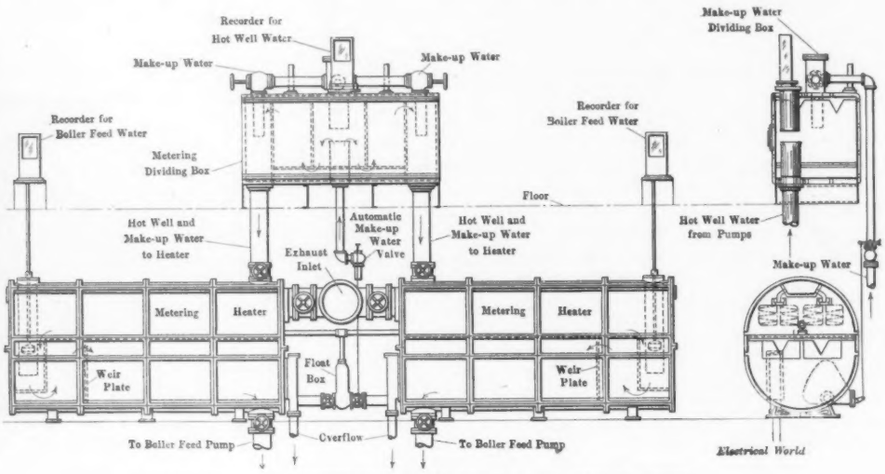
Large Feed-Water Meters

The largest boiler-feed water meters so far ordered are now under construction in the shops of the Harrison Safety Boiler Works, of Philadelphia. This equipment has a capacity of 1,200,000 lb. of water per hour, which is equivalent to about 30,000 boiler-hp, or 100,000 turbine hp.

The combined apparatus is more than a meter, however, since it also serves as a hot-well for the condensed turbine returns, as a make-up water regulator for supplementing these returns, and as a boiler-feed water heater, utilizing the steam exhausted by circulating pumps, boiler-feed pumps, etc., to heat the total boiler-feed supply up to 210 deg. Fahr.

Besides measuring the total boiler-feed supply, from which may be determined the amount of water evaporated per pound of coal used, as well as the efficiency and capacity of the boilers, the outfit also measures the condensate from the main turbines separately, so that by comparison with the machine watt-hour meters the daily average steam economy of the turbines can be checked.

The metering device employed is the V-notch weir, which was selected because of its accuracy at small flows as well as at the rated flow. It was incorporated in the Cochrane feed-water heater because the total boiler-feed supply, including raw make-up water and drips and returns, is here brought together before being fed to the boiler. Inclosing the notch within the meter also avoids all annoyance and loss of heat through escape of vapor.



APPARATUS FOR METERING 1,200,000 LB. OF BOILER FEED

A great advantage of the notched-weir method is that by reading the head on the weir and calculating the flow therefrom according to carefully verified formulas the indication of the recording instrument can be checked at any time. To obtain the same verification with other forms of meters involves weighing or measuring tests which often cause no little expense.

Referring to the illustration, the condensed returns will be seen to flow into the central compartment of the combined meter and dividing box, located on the turbine floor. From this central chamber the water passes under horizontal baffles, one on either side, into the still-water chambers, from which it overflows through two V-notches to the outflow chambers.

The raw make-up water enters a dividing box located above the hot-well and meter chamber just described, where it is separated into two equal parts, each flowing into the corresponding outflow compartment of the meter chamber. From the outflow compartments the water descends to the two metering heaters, operated as a single heater on the multiple-unit system. Provision is made for cutting either heater out of service for cleaning or inspection while the other continues in operation.

From the cold-water trough of the heaters the water overflows upon the trays and is heated to 210 deg. Fahr., after which it travels to the end of the heater and passes downward under a baffle, and then up into a "still-water chamber." From the latter it overflows through two V-notch weirs into a large storage and pump-supply chamber that occupies nearly the whole lower half of the heater shell.

The large size of these pump-supply chambers is of considerable importance, since it insures a fairly uniform flow through the meter proper, without fluctuation, independently of racing of feed pumps or other disturbances in the boiler-feed line.

The level of the water in the still-water chamber is recorded by a simple mechanical device, which also gages the flow from instant to instant throughout the day, besides giving the total flow taking place in any given period of time.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

The Increase in the Number of Holding Companies.—In our issue for Dec. 28, 1912, page 1353, we presented the results of an analysis which was made to determine the extent to which centralization of ownership, as shown in the number of holding companies, had progressed in this country in cities of 5000 or more population. This analysis showed that as of Sept. 30, 1912, in 1159 such cities there were 528 syndicate or holding company plants, 524 independent plants and 205 municipal plants, there being included in these ninety-eight cities in which there is competition between two or more of these three classes of service. In *Moody's Magazine* for February, 1912, Mr. Edward B. Lee makes the following observation upon the results of our analysis: "It does not follow because the electric light and power plants of more than 45 per cent of the cities of 5000 population or more in the United States have ceased to be independent properties that no more successful holding companies for this kind of property can be organized. It does most certainly follow, however, that greater caution and judgment than ever before must be used in the acquisition of electric light and power properties for holding company purposes, as much of the cream has been skimmed off and as there is more competitive buying of properties and as the owners of the properties still independent are apt to hold them for prices much higher than were paid for properties now a part of successful holding companies organized a few years ago. It would not be surprising if in the eager search for properties now so manifest prices were paid which even the advantages from holding company management cannot entirely overcome. Accordingly, investors would do well to use as much care and discrimination in purchasing the securities of holding companies as in purchasing securities of any individual company."

Will Tie in Its Ohio Properties.—With more economical operation as the object in view, the American Gas & Electric Company, 30 Church Street, New York, is planning to shut down the small generating stations now supplying energy to a number of Ohio communities in which it has purchased the public-utility properties, to divide these communities into groups and to supply each group with electrical energy from a large central station. Four groups are to be arranged at this time. One of these will be composed of the small towns near Newark, Ohio; the second of the towns near Canton, the third of those near Tiffin, and the fourth of the communities around Wheeling, W. Va. As part of the plan, a transmission line is to be built from Newark to Lancaster, and this will be eventually tied in with a line from Wheeling, W. Va. A 10,000-kw station has just been completed in the last-named place and will be enlarged later on to possibly 40,000 kw. A 5000-kw station is in course of erection at Newark, and this will be enlarged to 15,000 kw later on. Among the Ohio properties of the American Gas & Electric Company are the Canton Electric Company, Licking Light & Power Company, Newark; Fremont Yaryan Company, Fremont; Ohio Light & Power Company, Tiffin; Lancaster Electric Light Company, and Mount Vernon Electric Company.

Kings County Electric Light & Power Meeting.—At a meeting of the stockholders of the Kings County Electric Light & Power Company and the Edison Electric Illuminating Company of Brooklyn on Feb. 24, the following board of directors for both companies was elected for the ensuing year: Frank Bailey, William Berri, Anthony N. Brady, Nicholas F. Brady, Horace C. DuVal, Walton Fergueson, Bernard Gallagher, William V. Hester, Seth L. Keeney, Thomas E. Murray, W. F. Sheehan, James N. Wallace and W. F. Wells. All of these were re-elected with the exception of W. F. Wells, who is now general manager of both companies and takes the place of W. W. Freeman, who was formerly general manager, vice-president and director of both companies. The combined annual report of the two companies for the year ended Dec. 31, 1912, shows gross operating revenue of $5,167,669, as compared with $4,707,914 in 1911. Operating expenses, including taxes and depreciation charges, were $3,379,343, as against $2,928,450 in the preceding year, and the balance to credit of profit and loss, after all deductions, was $101,408, as compared with $178,288 in 1911.

Annual Statement of Northern States Power Company.—For the year ended Jan. 31, 1913, the Northern States Power Company reports for itself and constituent companies gross earnings of $3,035,723. It is to be noted, however, that this includes the results from the operation of the Minneapolis General Electric Company for only the eight months from June 1, 1912, to Jan. 31, 1913. The net earnings were $1,504,573 and from these were paid fixed charges amounting to $920,484 and preferred-stock dividends of $447,698. The Northern States Power Company has $5,975,000 of common stock outstanding, $8,386,700 of preferred stock and $5,000,000 of 6 per cent notes. The item of constituent companies' bonds, etc., amounted to $17,465,000. This includes seventy shares of Minneapolis General Electric Company 6 per cent preferred stock, which is not yet acquired, although dividends on it are included in the item of fixed charges.

Johns-Manville Company Reported as Interested in Chicago Factory Site.—Daily newspapers publish a report that the H. W. Johns-Manville Company has purchased a large site at Riverdale, on the southern limits of Chicago, on which to erect a manufacturing plant to cost several million dollars and to employ several thousand hands. No official confirmation of the story has been authorized, although it is believed that the company has obtained options on land in the outskirts of Chicago. If a factory should be built in or near Chicago, it would probably be devoted to the company's asbestos and pipe-covering products rather than its various electrical specialties.

Defeat Municipal Ownership Plan for Sharon (Pa.).—The city of Sharon, Pa., at a referendum election held recently, rejected a proposition to erect a municipal lighting plant. The plan was defeated by a majority of 89 in a vote of 1193. In May, 1912, a proposition to bond the city for the construction of the plant was carried, but as a reduction took place subsequently in the rates of the central station company, this proposition was again referred to the voters, with the result stated above. A five-year contract for all the municipal lighting requirements will be signed by the City Council with the Mahoning & Shenango Railway & Light Company.

Sell Property of Allis-Chalmers Company.—In accordance with the reorganization plan, the personal property of the Allis-Chalmers Company was sold on Feb. 27 for $4,000,000, in Milwaukee, to representatives of the reorganization committee, who were the only bidders. The sale included stocks, bonds, mortgages, raw material, accounts and orders. The real estate was sold on Feb. 3 for $2,250,000, as noted in these columns.

Growth of Tungstolier Business.—Owing to the rapid growth of its business in the past few years, the Tungstolier Works of General Electric Company have found it necessary to build a new factory at Cleveland, Ohio. The new plant will be one of the greatest fixture-manufacturing institutions in the country.

Increases Its Capital Stock.—The Tampa (Fla.) Electric Company has increased its capital stock from $1,870,000 to $2,244,000.

Detroit Edison's Year.—The annual report of President Alexander Dow of the Detroit Edison Company, Detroit, indicates a very rapid growth of the business in that city. A 15,000-kw generator has been ordered for delivery early in the summer, and it will be installed in the No. 2 station. Improvements begun in 1912 will almost double the capacity of Station No. 1 as compared with 1909 by the end of this year, when the combined capacity of the two stations will be 93,000 kw. Mr. Dow, however, says this will be no more than the company will need if the city continues its growth, and it will be insufficient for 1914. To provide for the early future the directors have been engaged in making provision for the construction of a power station on the river front about 8 miles above Delray. Concerning the operation of the Detroit Edison Company and its constituent companies in 1912, President Dow says: "The gross earnings for the year were $4,385,615.17, as compared with $3,598,094.11 for the year 1911, an increase of $787,521.06, or 21.8 per cent, and the net earnings were $1,858,434.85, as compared with $1,536,904.22, an increase of $321,530.63, or 20.9 per cent. and the surplus after interest charges paid and accrued was $1,145,569.20, as compared with $853,174.90, an increase of $292,334.30, or 34.2 per cent. The business of the Eastern Michigan Edison Company included in the foregoing—that is to say, the business of the territory beyond the city of Detroit and its immediate vicinage—is $431,071.99 gross earnings and $181,570.52 net earnings, increases of 23.3 and 19.9 per cent respectively. The number of general light and motor-service customers connected increased from 55,407 to 70,763. Our business in Detroit was very good in 1912 and the prospects for 1913 are equally good."

New Plan for Doherty Companies.—The directors of the Cities Service Company, the Consolidated Cities Light, Power & Traction Company and the Utilities Improvement Company have approved a plan by which an exchange of underlying companies has been effected by these three corporations, and additional companies have been taken over. Henry L. Doherty & Company, organizers and managers of the three corporations, state that under the rearrangement and by the taking over of the new properties the net earnings of the Cities Service Company will be increased from $1,113,732 for the year ended Dec. 31, 1912, to a basis of $1,757,798 for the year, and the amount earned for the common stock increased from a little over 9 per cent to more than 12 per cent, even on the large capitalization under the new plan. The net earnings of the Consolidated Cities Light, Power & Traction Company, which were $308,288 for the year ended May 31, 1912, will be increased, they state, to a basis of $715,232, with an earning power for the stock of 5.16, as compared with a little more than 2.16 per cent. The net earnings of the Utilities Improvement Company, which were $1,083,000 for the year ended Dec. 31, 1912, are estimated at $1,720,400, which will give 5.18 per cent on the outstanding common stock.

Long Acre Electric Light & Power Progress.—The Public Service Commission for the First New York District, by a vote of three to two, has adopted a resolution directing its counsel to prepare a certificate approving the construction of an electric-light plant by the Long Acre Electric Light & Power Company, New York. As has been recorded previously in these columns, the Long Acre company applied in 1908 to the commission for permission to issue $50,000,000 in bonds and $10,000,000 in stock. This application was denied, and the company took the matter to court. The Appellate Division decided against the commission, and directed it to permit the company to issue stocks and bonds in an amount sufficient for its legitimate needs. Acting under that decision, the commission subsequently let the company issue about $2,000,000 in stock and $2,000,000 in bonds. The New York Edison Company appealed from this order to the court. The Appellate Division again upheld the order granting the Long Acre company permission to issue securities. The case was taken to the Court of Appeals, which a few months ago reversed the decision and upheld the original decision of the commission.

Public Service Company of Northern Illinois Absorbs Gas Company.—The stockholders of the Public Service Company of Northern Illinois, at the annual meeting in Chicago on Feb. 24, approved the proposition to absorb the Northwestern Gas Light & Coke Company, and the merger is now an accomplished fact. The Northwestern Gas Light & Coke Company is said to control the sale of gas in forty-four suburbs north and west of Chicago, serving a population of 200,000. It has plants in Oak Park, Blue Island and Evanston, Ill. Control of the Northwestern company recently passed to Samuel Insull personally and now is again transferred to the Public Service Company of Northern Illinois. The stockholders of the latter company authorized the issuance of 20,000 shares of common stock to be given to the stockholders of the Northwestern company in exchange for their stock. It was announced that the Public Service Company of Northern Illinois will soon go out of the street-railway business, as it has decided to sell the one small line which the corporation now owns and operates in Streator, Ill. The old directors of the company were re-elected.

Crocker-Wheeler Company on Business Outlook.—An official of the Crocker-Wheeler Company, Ampere, N. J., was quoted this week as follows on the outlook in the electrical business: "The Crocker-Wheeler Company is employing 25 per cent more men at its factories than in February, 1912, but many orders for materials placed last August with steel companies have not yet been delivered. This delay in delivery applies to steel products in general and deliveries are now at five or six months. The copper market, on the other hand, has eased off to some extent. The general tendency of the electrical business shows a slackening, but the majority of the companies report that they have booked more business so far this year than in the corresponding period of a year ago. Prices of material have held very firm, except pig-iron, which has gone down. The chief congestion is in sheet steel, which is essential for all sorts of electrical machinery."

New Central Colorado Reorganization Plan.—The reorganization committee of the Central Colorado Power Company has filed with the Columbia-Knickerbocker Trust Company, New York, and the Commonwealth Trust Company, of Boston, a revised plan of reorganization, in place of that dated Nov. 25, 1912, and referred to in these columns Dec. 7, 1912. Under the new plan, bondholders of the Central Colorado company will receive 90 per cent of their principal in common stock of the new company instead of the 75 per cent provided in the former plan. The committee states that under the new plan it sees an excellent future for the new company in furnishing electrical energy for operating the mountain divisions of railroads and in the acquisition of new properties.

New Owners for Hornell (N. Y.) Company.—The Hornell Electric Company, which furnishes electric light and steam heat for the city of Hornell, N. Y., has changed ownership, the new owners taking the property on Feb. 28. Harvey L. Elkins, of Philadelphia, was elected president; Eugene F. McCabe, of Titusville, Pa., vice-president and general manager; William Maul Measey, of Philadelphia, treasurer, and William J. Seltzer, of Philadelphia, secretary. These gentlemen, with Samuel T. Beatty, of Dansville, N. Y., form the board of directors. L. T. Mason, of Hornell, is the superintendent in charge. This syndicate owns and operates plants in Dansville, N. Y.; Titusville, Pa., and Moberly, Mo.

Diesel Engines for Arizona Mining Plants.—The Usine Carels Frères, Ghent, Belgium, of which W. R. Haynie, 30 Church Street, New York, is United States representative, is contracting with Phelps, Dodge & Company, 99 John Street, New York, for two 1000-hp, two-cycle, four-cylinder Diesel-type engines for use at one of its Arizona mining plants. These engines will be direct-connected to 60-cycle alternators. This, it is said, is the first sale of stationary-type Diesel engines as large as these in this country.

Goulds Manufacturing Company's Annual Meeting.—The annual meeting of the stockholders of the Goulds Manufacturing Company was held at Seneca Falls, N. Y., Feb. 24. No change was made in the board of directors, and the following officers were re-elected: President, N. J. Gould; vice-presidents, D. V. Colby, W. D. Pomeroy, W. E. Davis, W. E. Dickey; secretary, H. S. Fredenburg; treasurer, B. R. Wells, and assistant treasurer, E. W. Medden.

Industrial Securities

Security	Capital Stock Listed	DIVIDEND		QUOTATION	
		Per Cent	Period	Feb. 26	Mch. 5
Allis-Chalmers, t.r., 3d pd...	$15,501,800	.....	.....	2⅞*	3
Allis-Chal., pf., t.r., 3d pd....	14,105,500	.....	.....	9⅛*	9⅛*
Amalgamated Copper.....	153,887,900	1½	Q	67⅝	72⅛
American Tel. & Tel.....	335,001,000	2	Q	132	132⅛
Electric Storage Battery, c.	16,074,425	1	Q	51½	52
General Electric.....	101,203,500	2	Q	137½	139
Mackay Cos., c.....	41,380,400	1½	Q	83*	83*
Mackay Cos., pf.....	50,000,000	1	Q	67½*	67
Western Union Tel.....	99,745,400	¾	Q	68	68*
Westinghouse E. & M., c.. .	33,821,200	1	Q	69½	70½
Westinghouse E. & M., pf. .	3,998,700	1¾	Q	117*	118

*Last price quoted.

NEW YORK METAL MARKET PRICES.

	Feb. 25 Bid.	Feb. 25 Asked.	March 4 Bid.	March 4 Asked.
Copper:				
Standard, spot.....	14.07½	.....	14.37½	14.75
	£ s d		£ s d	
London, standard, spot.....	64 0 0		66 0 0	
Prime Lake.....	14.75 to 14.85		14.87½ to 15.00	
Electrolytic	14.70 to 14.80		14.85 to 14.95	
Casting	14.60 to 14.65		14.70 to 14.80	
Copper wire, base.....	16.25		16.00 to 16.25	
Lead	4.35		4.35	
Nickel	40.00 to 45.00		40.00 to 45.00	
Sheet zinc, f.o.b. smelter.....	9.00		8.25	
Spelter, spot.....	6.37½		6.35 to 6.45	
Tin, spot.....	47.75		47.75	
Aluminum:				
Prompt delivery.....	25.50 to 26.00		25.50 to 26.00	
Future	25.50 to 26.00		25.50 to 26.00	

OLD METALS.

Heavy copper and wire.....	13.37½	13.50
Brass, heavy.....	8.75	9.00
Brass, light.....	7.75	7.75
Lead, heavy.....	4.15	4.15
Zinc, scrap.....	5.37½	5.12½

COPPER EXPORTS IN MARCH.

Total tons to March 5..... 6,105

Personal

Mr. George Ostrander has been appointed superintendent of power and light at Brampton, Ontario.

General George H. Harries was appointed a delegate to the Lakes-to-Gulf Good Roads Association, which met in Washington March 6.

Mr. W. A. Brothwell has been elected treasurer of the Essex (Conn.) Light & Power Company, succeeding Mr. W. G. Seeley, who becomes vice-president.

Mr. Albert Mohr, vice-president of John Mohr & Sons, boiler manufacturers, Chicago, has been appointed one of the South Park Commissioners of that city.

Mr. T. H. Hogg, formerly managing editor of *The Canadian Engineer*, has resigned to become associated with the Hydro-Electric Power Commission of Ontario.

Mr. L. A. McArthur, former assistant manager of the Pacific Power & Light Company, of Portland, Ore., is now stationed at North Yakima, Wash., as local agent for the same corporation.

Mr. R. W. Clark, for the last five years assistant commercial manager of the Minneapolis General Electric Company, has joined the staff of the Puget Sound Light & Power Company at Seattle, Wash.

Mr. F. J. Forbes has resigned as superintendent and chief electrician of the Portage (Wis.) Electric Light Company to remove to Racine, Wis., where he will have charge of outside plant construction.

Mr. Eugene F. McCabe, vice-president and manager of the Titusville (Pa.) Light & Power Company, has been appointed vice-president and general manager of the Hornell (N. Y.) Electric Company.

Mr. Arthur H. Hull, for the past three and a half years associated with the engineering department of Smith, Kerry & Chase, has recently joined the designing engineering staff of the Hydro-Electric Power Commission of Ontario.

Mr. L. M. Page, formerly in charge of the Madison (Wis.) sales office of the Fort Wayne Electric Works, has succeeded Mr. T. J. Ryan as district manager of the Fort Wayne Electric Works in Cincinnati.

Mr. Thomas F. Kelly, formerly contract agent for the Dominion Power & Transmission Company of Hamilton, Ont., has been appointed sales manager of the Dayton Power & Light Company, of Dayton, Ohio.

Mr. Samuel Insull, president of the Commonwealth Edison Company, Middle West Utilities Company and other electric-service companies, returned to his desk in Chicago last week after an extended sojourn in Europe.

Mr. William G. Merowitz has severed his connection with the Holtzer-Cabot Electric Company to become power apparatus sales specialist for the Northern Electrical & Manufacturing Company of Montreal, Canada.

Mr. F. A. Creighton, for several years city engineer of Prince Albert, Saskatchewan, Canada, has been appointed manager of the civil hydroelectric development work at La Colle Falls, 15 miles distant from Prince Albert.

Mr. T. J. Collins has been appointed contract agent for the Amesbury Electric Light Company, of Amesbury, Mass. Mr. Collins was formerly connected with the Central Massachusetts Electric Company at Palmer, Mass.

Prof. George Goldman, of the electrical engineering department of Syracuse University, recently addressed the Cleveland Section of the American Institute of Electrical Engineers, on the subject of transformers for multi-frequency operation.

Mr. W. W. Cole has been appointed general manager of the Citizens' Light & Power Company, of Oil City, Pa., succeeding Mr. F. D. Shaffer. Mr. Cole has for several years been associated with the public utilities department of the Day & Zimmerman Company.

Mr. W. J. Richardson has become superintendent of the Radford Light & Power Company, of Radford, Va. Mr. Richardson, formerly of Ann Arbor, Mich., was until recently superintendent of the Carlisle Electric Light & Power Company, of Carlisle, Ky.

Prof. C. R. Moore, who has been in charge of electrical design at Purdue University, plans to devote a portion of his time hereafter as engineer for the Lafayette Electric & Manufacturing Company, of Lafayette, Ind. Prof. Moore will continue his course of lectures on design at the university.

Mr. W. J. McCorkindale has resigned as vice-president and manager of the Marquette County Gas & Electric Company, of Ishpeming, Mich., to become manager of the Wilmington (Del.) Gas Company. Mr. McCorkindale will also become a member of the executive board of the C. H. Geist Company, of Philadelphia, which controls the Wilmington gas property.

Mr. Albert W. Childs has been appointed superintendent of sales for the Southern California Edison Company, of Los Angeles, Cal., in which position he has general charge of all lighting and motor-service salesmen, supervision of contracts, etc. For several years past Mr. Childs has held the position of assistant general agent. He entered the service of the Edison Electric Company eleven years ago and has since held successively the positions of bookkeeper, cashier, district agent and assistant general agent. Mr. Childs is forty-three years of age and received his education at the Northwestern University and the Dakota Agricultural College. He first entered the field of business as a special agent and adjuster for an insurance company in the Pacific Northwest, and later bought an insurance agency in Redlands, Cal., resulting in his removal to that State, where in 1902 he joined the staff of the Edison Electric Company.

ALBERT W. CHILDS

Mr. E. J. Phillip, who has been superintendent of the Berlin (Ont.) gas and electric plants for eight years, has resigned to accept the position of manager of the water and light department at Brockville, Ont. He succeeds Mr. C. T. Wilkinson, who retires to go into business. Mr. Phillips had been connected with the Berlin plant since 1904.

Mr. E. A. Sessions has retired as a member of the firm of Woodmansee, Davidson & Sessions, consulting engineers, Chicago. Mr. Sessions is a fellow of the American Institute of Electrical Engineers, a member of the American Society of Mechanical Engineers, a member of the Illuminating Society, and an associate member of the American Society of Civil Engineers.

Mr. R. J. Hiller, of Montreal, Que., has severed his connection with the Canadian General Electric Company, to become sales manager of the Engineering Equipment & Supply Company, St. James Street, Montreal. Mr. Hiller has been identified with the Canadian electrical industry since 1886, when he entered the employ of the Royal Electrical Company of Montreal.

Mr. Ralph W. E. Donjes, of Camden, N. J., was appointed a member of the New Jersey Board of Public Utility Commissioners by Governor Wilson, to succeed Mr. Robert Williams, of Paterson, N. J. The appointment has been confirmed by the Senate. Mr. Donjes is an attorney and has served as captain in the Third Regiment and on the military staff of the Governor.

Mr. Leo Schüler, general secretary of the Elektrotechnische Verein, Berlin, Germany, attended the mid-winter convention of the American Institute of Electrical Engineers, Feb. 26 to 28, as the special delegate of the Verband Deutscher Elektrotechniker. On the evening of Feb. 27 the standards committee of the American Institute tendered an informal dinner to Mr. Schüler.

Mr. John Gilmartin has resigned as foreman of the meter department of the Toledo Railway & Light Company, Toledo, Ohio, to take charge of the meter department of the Detroit Edison Company. Mr. Gilmartin, who began his service with the Toledo company twenty years ago, has served on several technical committees of both the National Electric Light Association and the Ohio Electric Light Association.

Mr. Thomas J. Ryan, recently made sales manager of the General Electric Company for the Cincinnati district, has been in charge of the Cincinnati office of the Fort Wayne Electric Works for the last fourteen years. Mr. Ryan began his electrical experience with the old Thomson-Houston Electric Company, and when that organization was succeeded by the General Electric Company he was retained by the latter. Later he was placed in charge of the Cincinnati territory by the old Fort Wayne Electric Corporation, and five years later, at the reorganization of that company, he retained the same position for the Fort Wayne Electric Works, being in charge of the Cincinnati office until his recent advancement. Mr. Ryan is a member of the Jovian Order and is greatly esteemed for his engaging personality.

Mr. Frank W. Frueauff, first vice-president and general manager of the Denver Gas & Electric Light Company, who has been spending a few weeks in Colorado in connection with the completion of several large irrigation projects now being developed by H. L. Doherty & Company, addressed 600 Colorado business men at a recent luncheon of the Denver Chamber of Commerce. During the course of his talk Mr. Frueauff decried the present tendency toward repressive legislation against corporations, advocating instead measures which through reasonable regulation and intelligent protection in the conduct of business will encourage capital investment. The speaker's comments were received with much enthusiasm and approval, both by his auditors and by the general public as reflected through the newspapers.

Mr. H. W. Eales has assumed the duties of assistant superintendent of distribution and assistant chief electrical engineer of the Union Electric Light & Power Company of St. Louis. Mr. Eales, who is a native of England, has recently been connected with the sales office of the General Electric Company in St. Louis. He came to this country at an early age and was graduated from Yale University in 1904. From 1904 to 1907 Mr. Eales took post-graduate work in engineering at the Sheffield Scientific School. He then entered the employment of the General Electric Company, continuing with it in various capacities until his connection with the Union Electric company. He is a member of the Sigma Xi and Phi Beta Kappa fraternities. The increase in the Union company's business and the new work made necessary by the forthcoming distribution of hydroelectric energy from Keokuk, it is explained, have made necessary Mr. Eales' addition to the staff.

Mr. Emile Berliner, to whom has been awarded one of the Elliott Cresson gold medals bestowed by the Franklin Institute for important contributions to telephony and to the science and art of sound reproduction, as noted in our columns last week, was born in Hanover, Germany, on May 20, 1851. He was educated in the public schools of that city and in the Samson High School, Wolffenbüttel, graduating from the latter in 1865. Five years later he came to America and while engaged in a mercantile pursuit took up the study of the electric transmission of speech. In 1877 he invented the loose-contact telephone transmitter bearing his name and which brought Bell's great invention of the preceding year within the range of commercial application and practical use. In the same year he effected another great advance in the telephone art by an application of the induction coil to step up the low-tension variable current through the loose-contact transmitter to a current of higher tension better capable of overcoming the impedance of long lines. These inventions were of fundamental importance to the telephone art and promise to be useful for many years to come. In 1878, on the formation of the Bell Telephone Company, Mr. Berliner accepted the position of chief inspector of instruments at its works in Boston, and in that capacity the first 20,000 transmitters that went into use passed through his hands. In 1881 Mr. Berliner, retaining his connection with the Bell Telephone Company as consulting expert, removed to Washington and, besides bringing out a number of other inventions relating to telephony, devoted his attention to the improvement of the talking machine. In 1887 he invented the gramophone, the first talking machine which utilized a record having a groove of even depth and varying direction and in which the record groove not only vibrates the recording stylus but also propels it. This invention he exhibited before the Franklin Institute in 1882, and a John Scott medal was subsequently awarded to it by the city of Philadelphia, on the recommendation of the Institute. The Berliner gramophone, now known in America as the "Victor" talking machine and throughout the world under various other trade names, has become the basis of a great and growing industry and an important agency of education and culture. Its popularization has been largely due to the system invented by Mr. Berliner for accurately and cheaply duplicating the original records. Mr. Berliner has latterly extended his inventive efforts into the field of aviation and has made notable progress toward perfecting a multi-cylinder motor of the internal-combustion type. His engine of this type, produced in 1907-8, with a rating of 35 hp, weighed only 97 lb. These were the first revolving cylinder motors successfully applied in aeronautical work and led the way to the extensive adoption of this type of motor for aeroplanes in Europe. In addition to his activity as an inventor, Mr. Berliner has given largely of his time to the study of the pathology of milk. His campaign of education on this subject led to the Washington Milk Conference of 1907, and his efforts have been fruitful of beneficial results. In this department of hygiene, as well as in his immediate field of research and invention, Mr. Berliner has made numerous contributions to scientific and technical literature.

EMILE BERLINER

Construction

TEMPE, ARIZ.—Bids are being received by the board of governors of the Salt River Water Users' Association, of Phœnix, for the construction of one-half mile of reinforced concrete tubing for part of the penstock of the new power plant at Tempe, Ariz. Work will soon start on the proposed plant.

YUMA, ARIZ.—The proposition to issue $300,000 in bonds for a water system, sewer system and electric-light plant and distributing system is under consideration. Plans are being prepared by Frank Brooks, city engineer.

LITTLE ROCK, ARK.—The State Board of Incorporators has granted B. J. Hamlin a franchise to develop water-power on Ten Mile Creek.

SULPHUR SPRINGS, ARK.—Bids will be received at the office of the 'mprovement Board, Sulphur Springs, until March 20 for furnishing material and constructing complete water-works and lighting plant, including power house, pump house, machinery and electrical equipment, water pipe, valves and a standpipe of 100,000 gal. capacity. Plans and specifications are on file at the office of the Improvement Board, Sulphur Springs, and at the office of A. C. Moore, Independence Building, Joplin, Mo. C. J. Williams is chairman of board.

BELDEN, CAL.—The Oro El. Corpn., of Oroville, is building a railway from Belden to Humbug Valley, a distance of about 9 miles, to transport material for its power project in the latter place.

BERKELEY, CAL.—The City Council has adopted a resolution providing for the installation of electroliers to be erected on both sides of University Avenue from Shattuck Avenue to Grove Street.

COLUSA, CAL.—In amended articles of incorporation of the Northern El. Ry. Co. the company has announced the construction of three lines in the immediate future as follows: Sacramento to Hamilton, Chico to Redding and Sacramento to Folsom, a total distance of 204 miles.

GLENDALE, CAL.—The Glendale & Eagle Rock Ry. Co., of Glendale, is planning to build an electric railway from the terminus of its present line in Verdugo Canyon to Montrose and to Los Angeles Avenue in La Crescenta, a distance of about 10 miles. E. D. Goode is president of the company.

GREENVILLE, CAL.—The Indian Valley Lt. & Pwr. Co., it is understood, will install a 1000-hp unit immediately at its plant on the North Fork of the Feather River, near Seneca. The remainder of the ultimate capacity of 30.000 hp will be developed gradually.

LOS ANGELES, CAL.—The Pacific Lt. & Pwr. Corpn., of Los Angeles, has a force of men in the San Gabriel Canyon doing development work in connection with a 6000-kw hydroelectric power plant. About 5 miles of tunnels will be built. The proposed plant will have a pressure head of approximately 1700 ft.

LOS ANGELES, CAL.—The Pacific Lt. & Pwr. Co. has purchased the property of the Oak Forest Land & Wtr. Co. The property adjoins Eagle Rock Park and embraces the upper end of Eagle Rock Canyon. The Pacific Lt. & Pwr. Co. has commenced the erection of a large transformer station on a portion of the property, which when completed will transform energy transmitted over the high-tension lines from the Big Creek plant.

PORTERSVILLE, CAL.—Work will soon begin on the erection of an additional transmission line for the San Joaquin Lt. & Pwr. Co., of Fresno, to connect the Strathmore substation with the substation at Famosa. The new line will be connected with the Tule River plant.

SPRINGVILLE, CAL.—Plans are being considered by the Sequoia Camp Meeting Association for making improvements to its property on Tule River. It is proposed to complete the water system for the grounds and install electric lamps at once. J. H. Turner, of Lindsay, is president of the association.

WASHINGTON, D. C.—Proposals wil be received at the office of the supervising architect, Treasury Department, Washington, D. C., until April 3 for the construction complete, including the electrical protection, conduit and wiring, lighting fixtures, plumbing, heating and ventilating equipment, of vaults, except vault doors, for the new building for the Bureau of Engraving and Printing, Washington, D. C. Drawings and specifications may be obtained at the above office. O. Wenderoth is supervising architect.

CHIPLEY, FLA.—Arrangements have been made by the Chipley Lt. & Pwr. Co. for installing electric lamps. Bids will be asked for installing machinery, etc., as soon as surveys are completed.

ST. PETERSBURG, FLA.—The St. Petersburg El. Lt. & Pwr. Co. is planning to build a 15,000-kw steam-power plant, for which bids for construction will be received March 10. R. E. Ludwig is designing engineer and H. C. Case general superintendent, both of St. Petersburg.

TAMPA, FLA.—Extensions and improvements are contemplated by the Tampa El. Co. during the year involving an expenditure of about $400,000. The company proposes to enlarge its main power house and plant at the foot of Jackson Street on the river front. The output of the plant will be increased 125 per cent.

CONYERS, GA.—The Panola Lt. & Pwr. Co., of Conyers, has applied to the State Railroad Commission for permission to increase its capital stock to $200,000. The company proposes to rebuild and enlarge its dam on the South River, 8 miles from Conyers, and increase the service. It also plans to build a steam plant at Lithonia to furnish electricity for lamps and motors there and to extend its service to Covington, where it has already applied for a franchise.

DALTON, GA.—The City Council has granted the Georgia Ry. & Pwr. Co. a franchise to supply electricity in Dalton for a period of 99 years. Under the terms of the franchise the company is to furnish energy to factories and industrial plants using 50 hp or more. Those using under 50 hp are to be supplied by the municipal plant.

GRACE, IDAHO.—The Last Chance Canal Co. advises us that it does not contemplate the construction of a hydroelectric power plant at present, but may take up the project in the future. Reported in the issue of Feb. 8 to be contemplating the installation of a power plant. George Telford is secretary and treasurer.

ASHLAND, ILL.—The Village Board has decided to dispose of the municipal electric-light plant and an ordinance offering it for sale has been ordered prepared.

AURORA, ILL.—The Interstate Tel. Co. has applied to the City Council for an extension of its franchise as it wishes to make improvements to its system, involving an expenditure of over $75,000. The proposed work includes the installation of a new switchboard, etc.

CAMBRIDGE, ILL.—Bids wil be received by E. E. Fitch, county clerk, until April 22 for wiring the new Henry County Infirmary.

CHICAGO, ILL.—In his last annual report the general superintendent of police asks for rehabilitation of the police, telephone and patrol-box system, at an estimated cost of from $100,000 to $300,000.

DE KALB, ILL.—The City Council has closed a contract with the Illinois Northern Utilities Co., of Chicago, for the installation of 60 concrete lamp posts and lamps.

ELGIN, ILL.—The annual budget of the City Council provides for an appropriation of $700 for an expert report upon the feasibility of establishing a municipal electric-light plant. The West Side Chamber of Commerce has appointed a committee to investigate street-lighting conditions. Dr. J. R. Tobin is president.

ELKVILLE, ILL.—C. T. Bass & Son have been granted a franchise to erect transmission line to distribute electricity for lamps and motors here.

ELMWOOD, ILL.—The Elmwood El. Lt. Co. has sold its property to R. S. Wallace, of Peoria, representing Eastern capitalists, who also operate the People's El. Service Co., of Farmington. The local plant supplies electricity in Elmwood, Yates City, Douglas, Maquon, Brimfield, Monica and Princeville. The transmission lines will be connected with the plants at Farmington and Cuba, so that power may be furnished from either plant in case of emergency.

ERIE, ILL.—The Illinois Northern Utilities Co., of Chicago, has asked the Village Board for a 90-day extension in which to complete a transmission line to Erie. In consideration of this grant the company offers to furnish electricity for lighting school buildings up to 400 kw per year. A 10-year contract for street lighting is asked.

HILLSBORO, ILL.—The electric railway company, which is financed by the Hillsboro El. Lt. & Pwr. Co., it is reported, has made arrangements to build this summer an interurban railway east from Hillsboro through Schram City, Irving and Witt to Nokomis. Negotiations for a franchise in Schram City have begun. The cost of the proposed railway is estimated at $400,000. J. J. Frey, of Hillsboro, is president.

JACKSONVILLE, ILL.—At an election to be held April 15 the proposition to issue $50,000 in bonds for the installation of a complete new municipal electric-light plant will be submitted to a vote. Joseph F. Brennan is commissioner of Department of Public Property.

LEWISTON, ILL.—The Lewiston El. Co. has increased its capital stock from $5,000 to $50,000.

MOLINE, ILL.—The Central Union Tel. Co. contemplates improvements to its lines in Moline and Watertown, involving an expenditure of about $70,000. A new exchange will be built in Moline and cable lines erected in Watertown.

MORRISONVILLE, ILL.—The Hillsboro El. Lt. & Pwr. Co. is installing a 200-hp turbo-generator set at its plant here to furnish energy during the winter in Morrisonville, Palmer, Harvel and probably Raymond. In the summer months power will be supplied from the plant at Hillsboro and the local power house closed down.

MOUNT PULASKI, ILL.—The Mount Pulaski El. Lt. & Pwr. Co. has asked the City Council for a 35-year franchise to operate an electric-light plant, the old franchise having expired. If granted the company will improve its plant. The company contemplates extending its transmission lines to Chesnut, Kenney and Latham to supply electricity in those places; also to farmhouses along the proposed lines.

PONTIAC, ILL.—The Public Service Co. of Northern Illinois, of Chicago, has purchased the local electric-light, power, gas, steam-heat and water plants from the Pontiac Lt. & Wtr. Co., together with the property of the Bloomington, Pontiac & Joliet Ry. Co., with all its franchises between Joliet and Bloomington. The railway is now in operation between Pontiac and Dwight, a distance of 18 miles. This city will be made a central distributing point for electrical service. The railway system is to be extended at once to Bloomington and Joliet.

SPRINGFIELD, ILL.—The Springfield Consol. Ry. Co. will build a storage station and an all-steel cooling tower at its power plant at Capital Avenue and Tenth Street, Springfield.

TISKILWA, ILL.—The Spring Valley Lt. & Pwr. Co., of Spring Valley, has applied to the Village Board for a franchise to supply electricity

for lamps and motors in Tiskilwa. Energy will be supplied from a transmission line which will be erected from Spring Valley to Buda and Neponset. The company asks for a 20-year contract for lighting the streets of the village at $15 per lamp per year. It also proposes to erect transmission lines from Spring Valley to Bureau and Depue.

WARREN, ILL.—The Village Board has accepted the proposition of F. T. Morrison, of Dixon, Ill., to establish an electric-light plant here.

GOSHEN, IND.—The City Council has voted to install ornamental street lamps in the business district.

INDIANAPOLIS, IND.—The Indianapolis Lt. & Ht. Co. has voted to increase its capital stock from $1,000,000 to $2,000,000, the proceeds to be used for improvements and extensions to its system. The company proposes to install a storage battery at the Wabash Street station and enlarge its Mill Street power house.

LOOGOOTEE, IND.—Application has been made to the City Council by George E. King, representing F. J. Burger & Co., of Petersburg, for a 20-year franchise to erect and operate an electric-light plant here. The company also asks for a street-lighting contract, to become effective at the expiration of the present contract, the amount to be not less than $1,800 per year for public lighting.

AUDUBON, IA.—R. G. Wieland, of Walnut, Ill., is negotiating for the purchase of the local electric-light plant. Mr. Wieland proposes to extend a transmission line to Exira to furnish electrical service there. If the deal goes through a 24-hour service will be established.

CHARLES CITY, IA.—The City Council has appointed a committee to look into the proposition submitted by George E. May, of the Charles City Wtr. Pwr. Co. The company offers to sell its entire property and business to the city for $75,000.

HAWKEYE, IA.—The proposition to grant a franchise to C. Miller & Sons, of Clermont, has been approved by the voters.

KEOKUK, IA.—Plans are being considered to change the entire street-lighting system, and to install a boulevard lighting system, covering the city. The Keokuk El. Co. has the contract for street lighting.

LEON, IA.—The Leon El. Co., of Leon, is erecting a transmission line to Garden Grove. The company has franchises to furnish electricity in Humeston, Leroy, Weldon and Van Wert.

OSSIAN, IA.—The installation of an electric-light plant in Ossian is under consideration. The cost of the plant is estimated at about $8,000.

PETERSEN, IA.—The equipment of the power plant of the Petersen Power & Milling Co. includes two Trump waterwheels equipped with Woodward governors, instead of two Woodward waterwheels, as stated in the issue of March 1.

VINTON, IA.—John Redmond, of Cedar Rapids, has transferred his property interests near site of proposed dam to William C. Dows, president of the Iowa Ry. & Lt. Co. The company, it is said, is making preparations to build a power dam.

ZEARING, IA.—The Village Board has called a special election to be held March 21 to vote on the proposition to grant a franchise to the Iowa River Lt. & Pwr. Co., of Eldora, to distribute electricity in the village.

AUGUSTA, KAN.—At an election held Feb. 24 the proposition to construct a municipal electric-light plant was carried. Work will begin on the proposed plant as soon as arrangements can be made. J. R. Switzer is city engineer.

CANTON, KAN.—Bids, it is reported, are being asked by the city officials of Canton for the installation of a municipal electric-light plant, bonds for which have been authorized.

DOUGLASS, KAN.—The installation of an electric-light plant in Douglass is under consideration. Local business men are said to be interested in the project.

SALINA, KAN.—The Salina Lt., Pwr. & Gas Co. has submitted a proposition to the City Council for the installation of an ornamental street-lighting system. The plans provide for the erection of fifty-seven ornamental standards, to cost about $4,300.

TURON, KAN.—At an election held recently the proposition to issue $20,000 in bonds for the installation of a municipal electric-light plant was carried.

LEXINGTON, KY.—The Lexington Utilities Co. has applied to the city commissioners for a 20-year franchise. The old franchise has still three years to run. The company asks for the new franchise to enable it to issue bonds to pay for improvements contemplated.

NAPOLEONVILLE, LA.—Bids will be receceived by the Mayor of Napoleonville until March 17 for furnishing material and installing a complete electric-light plant and system. Oil is to be used as fuel.

BELFAST, MAINE.—The Penobscot Bay El. Co., of Belfast, has secured the contract for wiring and lighting the residence of Ira M. Cone, of Chicago, Ill., now being constructed in Northport. Work will begin on the extension of the transmission line early in the spring. The company will probably furnish electricity for lighting the cottages on the North Shore at Northport.

BALTIMORE, MD.—Plans are being considered by Ezra B. Whitman, city water engineer, and Robert J. McCuen, superintendent lamps and lighting, for utilizing the overflow from the dam at Loch Raven to generate electricity for lamps.

CHESAPEAKE CITY, MD.—The Elkton Lt. & Pwr. Co., of Elkton, has submitted a proposition to the town to furnish electricity for lamps and motors.

HAGERSTOWN, MD.—Arrangements are being made for the installation of an ornamental street-lighting system here. The cost of the standards is estimated at about $30 each, to be paid by property owners. The city will maintain the lamps.

CHICOPEE, MASS.—Plans have been announced by the Amherst Pwr. Co. for enlarging its substation in Chicopee to enable it to supply 1500 kw additional power contracted for by the Springfield St. Ry. Co., The Amherst company will duplicate the present equipment of the plant. The contract will take effect as soon as the installation is completed.

CLINTON, MASS.—The Selectmen and the Clinton Gas Lt. Co. have reached an agreement on the new street-lighting contract. Under the terms of the new contract the company will furnish 100 tungsten lamps of 80 cp and 557 tungsten lamps of 40 cp. At present there are 33 tungsten lamps of 40 cp and 304 tungsten lamps of 32 cp.

EAST MATTAPOISETT, MASS.—The New Bedford Gas & Edison Lt. Co., of New Bedford, has submitted a proposition to the owners of the cottages on Crescent Beach offering to extend its electric-lighting service to that colony.

GREENFIELD, MASS.—The Greenfield El. Lt. & Pwr. Co. has sold all its rights in the Deerfield River, except Gardner Falls power rights, to the New England Pwr. Co., of Maine. The sale includes real estate and flowage rights along the river at the site of the dam construction near West Deerfield.

LYNNFIELD, MASS.—Committees representing the Lynnfield Public Improvement Society and the Lynnfield Center Civic League have decided to put an article in the town warrant providing for lighting the town with fifty lamps in each village for a period of five years, the placing of the contract to be left with the committee to be appointed by a vote of the town.

SANDWICH, MASS.—The Buzzards Bay El. Co., of Falmouth, has submitted a proposition offering to extend its transmission lines to Sandwich, providing sufficient patronage is guaranteed the company.

SPRINGFIELD, MASS.—The Springfield St. Ry. Co. has contracted with the Amherst Pwr. Co. for additional power to operate the city lines when the Margaret Street plant is overtaxed. The contract calls for 1500 kw.

SPRINGFIELD, MASS.—Plans are under consideration for improvements to the power plant and shops of the United States Armory at Springfield. Two new boilers will be installed this spring, and it is hoped to install a second pair in the early summer. Col. W. S. Peirce, commandant, is planning to abolish the present system of mechanical drive from a Corliss steam engine as soon as the appropriation can be secured and to substitute electric motors in the gun-making factory and other portions of the plant. A turbo-generator installation will probably replace the existing equipment.

WARE, MASS.—The Selectmen have authorized the Ware El. Co. to replace the southern circuit of street lamps with cluster lamps similar to those now in use on the northern circuit. H. M. Parsons is superintendent of the Ware El. Co.

WORCESTER, MASS.—The Wright Wire Co. has entered into a 10-year contract with the Connecticut River Transmission Co., Fitchburg, to supply energy to operate both its Worcester and Palmer plants. The wire company will abandon its own plants.

FLINT, MICH.—The lighting committee of the Council is considering the installation of cluster lamps.

HOUGHTON, MICH.—Work has been begun on the construction of the power house for the new hydroelectric power plant of the Oliver Milling Co. The building will be 55 ft. by 61 ft., three stories high. Work will soon start on the new concrete dam. G. H. Robey has charge of the work.

MONROE, MICH.—The Toledo, Ottawa Beach & Northern Ry. Co., of Toledo, it is reported, will extend its railway from Toledo Beach to Monroe Piers, a distance of 7 miles.

MOUNT MORRIS, MICH.—An election will be held March 10 to submit the proposition of granting a franchise to furnish electricity for lamps and motors for both the business and residential district.

STEPHENSON, MICH.—The Menominee & Marinette Lt. & Trac. Co. has been granted a franchise to erect transmission lines to distribute electricity here. The residents of Daggett, 3 miles distant, are negotiating with the company for extension of the line to that place.

DULUTH, MINN.—The Great Northern Pwr. Co., of Duluth, has decided to install an additional motor-generator set at its Thompson plant, increasing the output of the plant from 48,000 hp to 62,000 hp. The cost of the work is estimated at about $300,000.

MANKATO, MINN.—A committee has been appointed by the Mankato Commercial Club to investigate the advisability of installing an ornamental street-lighting system on Front Street. The Consumers' Pwr. Co. has the contract for street lighting.

ROSEAU, MINN.—The proposition to issue $14,000 in bonds for the installation of a municipal electric-light plant will be submitted to the voters on March 11. P. H. Buran is clerk.

WYOMING, MINN.—The Village Council has asked the St. Croix El. Lt. Co. to extend its transmission line from Chicago City to Wyoming to furnish electricity here.

CRANE, MO.—J. R. Woodfill, representing the Aurora El. Lt. Co., of Aurora, and W. N. Castle, of Lancaster, Pa., representing Eastern capi-

talists, have submitted a proposition to install an electric-light system in Crane.

GALENA, MO.—Work has begun on the construction of a dam and hydroelectric power plant on the James River at Virgin Rock, near Galena. General William H. Standish, of Aurora, and associates are interested in the project.

ROLLA, MO.—Proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until April 1, for the contstruction, including plumbing, heating apparatus, gas piping, electric conduits and wiring, interior lighting fixtures and approaches, of the United States post office at Rolla, Mont. Drawings and specifications may be obtained at the above office or from the custodian of site. O. Wenderoth is supervising architect.

SPRINGFIELD, MO.—Steps have been taken by local business men to organize a company with a capital stock of $200,000 to build a private plant here. The proposed plant is to be sold to the city any time it wants to try municipal ownership.

WEBB CITY, MO.—Plans are being considered by the City Council for the installation of a new street-lighting system here. Cluster lamps and arc lamps are both under consideration.

HAVRE, MONT.—The committee appointed to make investigations relative to the installation of a municipal electric-light plant has reported in favor of the project and recommends that the proposition to issue $50,000 in bonds for this purpose be submitted to the voters at the coming spring election.

PLAINS, MONT.—The Thompson Falls Pwr. Co. contemplates extending its transmission lines to furnish electricity in Iron Mountain, St. Regis, Paradise, Plains and Eddy.

FREMONT, NEB.—Work, it is reported, will soon begin on the construction of a hydroelectric power plant at Fremont. Electricity generated at the plant will be transmitted to Omaha and distributed by the Omaha El. Lt. & Pwr. Co.

HASTINGS, NEB.—The City Council has instructed the light commissioner to purchase 60 arc lamps to be erected in outlying portions of the city.

HILDRETH, NEB.—The proposition to issue $4,000 in bonds for an electric-light system and $6,000 in bonds for water-works has been approved by the voters.

LINCOLN, NEB.—George Steinmeyer, of Holmesville, has filed application with the state engineer asking for water rights on the Blue River to be developed for power purposes. One of the plants will be located at Hoag, where 218 hp will be developed, and the other at Barneston, developing 670 hp. A dam 20 ft. high will be built at each place.

OREANA, NEV.—Surveys have been made for the site of the power plant in Oreana to be erected by the Nenzel El. Co., which will supply electricity for lamps and motors for mines and towns of Rochester and Oreana. Bids have been received for machinery, and work will begin at once on construction of power plant and erection of transmission lines. The initial installation will provide for about 200 hp, which will be increased as the demand increases.

GREENFIELD, N. H.—The Keene Gas & El. Co., of Keene, and the Ashuelot Gas & El. Co., of Ashuelot, have filed a joint petition with the Public Service Commission asking permission to extend their transmission lines into the town of Greenfield.

LACONIA, N. H.—The Laconia Gas & El. Co. has petitioned the Public Service Commission for permission to extend its transmission lines into the town of Tilton.

NEW BOSTON, N. H.—The Manchester Trac., Lt. & Pwr. Co., of Manchester, is contemplating extending its transmission lines to New Boston for the purpose of supplying electricity for lamps and motors.

MORRISTOWN, N. J.—The Morris & Somerset El. Co. has been granted permission by the Board of Public Utility Commissioners to issue $50,000 in bonds, the proceeds to be used for extensions and improvements to its plant and distributing system.

MORRISTOWN, N. J.—The Morris & Somerset El. Co. has entered into a contract with the Newark Conference Camp Meeting Association for lighting the streets of the village of Mount Tabor for ten years. The contract provides for eighty-six street lamps; also for lighting about 150 private residences during the summer.

TRENTON, N. J.—Plans are being considered for establishing a municipal electric-light plant to supply electricity for lighting the streets and public buildings in the city. It is expected that the proposed plant will be located at the pumping station. William F. Burk and George B. La Barre are city commissioners.

TRENTON, N. J.—An appropriation of $60,000 has been asked for the erection of a central power plant at the New Jersey State Hospital for the Insane. The present plants are in need of repairs and with the erection of the proposed building for the criminal insane additional power will be required.

TRENTON JUNCTION, N. J.—The Ewing township committee is negotiating with the Public Ser. El. Co. for the installation of an electric-lighting system in Trenton Junction.

BINGHAMTON, N. Y.—The Council has passed a new boulevard extension bond issue ordinance, which includes the Court Street Bridge, Main Street to Front and Water Street, from Court to Henry, in the original plans, increasing the total cost to $80,000, and making this the amount to be voted on at the election to be held March 21.

CHATHAM, N. Y.—The Public Service Commission, Second District, has authorized the Chatham El. Lt. & Pwr. Co. to exercise franchises in the towns of Ghent and Claverack and the village of Philmont. The application was supported by the Board of Trustees of Philmont.

ILION, N. Y.—The proposition to issue $20,000 in bonds, the proceeds to be used for improvements to the municipal electric-light plant will be submitted to the voters at the next village election. The improvements contemplated include the purchase and installation of a 600-hp steam turbine, a 200-hp boiler and a 500-kw generator.

NEW YORK, N. Y.—The Public Service Commission has adopted a resolution directing the counsel to prepare a certificate approving of the construction of the plant of the Long Acre El. Lt. & Pwr. Co. and authorizing the exercise of its franchise.

POUGHKEEPSIE, N. Y.—The Board of Supervisors of Dutchess County is considering the question of installing an electric plant to light the county court house. B. Frank Green, of Matteawan, is chairman of the board.

DURHAM, N. C.—The Board of Aldermen has awarded the contract for street-lighting to the Durham Trac. Co. The contract is for a period of ten years and provides for 200 arc lamps at a cost of $60 each per year. The company agrees to install new street lamps throughout the city.

HENDERSON, N. C.—Arrangements have been perfected by the Manufacturers' Pwr. Co. for a hydroelectric development on Green River, in Henderson County, North Carolina. Plans provide for a concrete dam, 164 ft. high, at the mouth of Big Hungry River, 7 miles from Henderson. The proposed power plant will develop about 50,000 hp and will involve an expenditure of about $1,000,000. W. S. Montgomery, of Spartanburg, is president, and John A. Law secretary and treasurer.

BERTHOLD, N. D.—The installation of an electric-light plant at the poor farm south of the city is contemplated by the Board of County Commissioners.

DEVIL'S LAKE, N. D.—The contract for the installation of the ornamental street-lighting system has been awarded to Roberts & Perkins, of Minneapolis, Minn., for $12,995.

NEW SALEM, N. D.—W. G. Woodruff, of Bismarck, is negotiating with local business men with regard to wiring the town for furnishing electricity for lighting purposes.

BENTON RIDGE, OHIO.—The Western Ohio Ry. Co., of Lima, contemplates extending its electric-lighting service to Benton Ridge. A transmission line will be erected from here to Rawson. It is proposed to furnish electricity to farmers along the line between Benton Ridge and Rawson.

COLUMBUS, OHIO.—The Columbus, Delaware & Marion Ry. Co. contemplates the purchase of one 500-kw turbine and three 250-hp boilers for its power plant in Marion during the year.

DAYTON, OHIO.—Negotiations are under way by the Ritchie-Wertz Co., of Dayton, with a view of erecting a four-story concrete power plant. It is expected that the proposed building will also supply factory accommodations for other concerns.

DELAWARE, OHIO.—The City Council has granted the Delaware El. Lt., Ht. & Pwr. Co. permission to replace the present arc lamps with luminous arc lamps. The company proposes to install an entire new equipment, except boilers, in its plant during the summer.

PAINESVILLE, OHIO.—The Cleveland, Painesville & Eastern R. R. Co., of Willoughby, has purchased the property of the United Lt. & Pwr. Co., of Painesville, which furnishes electricity for lamps and motors in towns and rural sections of Lake and Ashtabula Counties. E. W. Moore, of Cleveland, is president of the Cleveland, Painesville & Eastern R. R. Co.; J. E. Latimer, of Cleveland, is president of the United Lt. & Power Co.

TOLEDO, OHIO.—Plans have been completed by the Toledo & Indiana Trac. Co. for extension of its railway from its present terminus at Bryan to Montpelier, a distance of 10 miles.

EUGENE, ORE.—The Oregon El. Ry. Co. is planning to extend its railway from Eugene to Roseburg, via Cottage Grove, this season, and will eventually build to Myrtle Point, and Coos Bay and thence south along the coast to San Francisco.

PORTLAND, ORE.—The contract for lighting fixtures for the central library building has been awarded to the J. C. English Co., of Portland, at $10,000.

PORTLAND, ORE.—The West Coast Engineering Co. has been awarded the contract for furnishing and installing an electric lighting system on the Broadway Bridge.

PORTLAND, ORE.—The Oregon El. Ry. Co., it is stated, will begin work at once on a 50,000-hp development on the McKenzie River. The company will add 43 new cars to its equipment.

PORTLAND, ORE.—The City Council has granted the Portland Ry., Lt. & Pwr. Co. a franchise to construct and operate 18 miles of street railway lines in Portland. The company will lay a third rail on Seventh Street from Hoyt to Jefferson and on Broadway. The cost of the work is estimated at $300,000.

SALEM, ORE.—The House of Representatives has passed the bill

appropriating $25,000 for the survey of the Celilo water-power project. The project is to be carried out in conjunction with the State of Washington.

PANAMA.—Sealed proposals will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until March 26 for furnishing electric traveling cranes, steel rail, angle bars, truck bolts, switches, track frogs, tie plates, track chisel, etc. Blanks and general information relating to this circular (No. 764) may be obtained from the above office or from the office of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.

CENTER SQUARE, PA.—The Citizens' Improvement Association of Center Square has decided to take steps to get an electric-lighting system for the township. Petitions are being circulated to secure the signature of property holders. It is proposed to install 60 lamps, at a cost of $60 each per year, the service to be furnished by the Counties Gas & El. Co., of Norristown.

MAHANOY CITY, PA.—The Harwood El. Co. expects to make improvements to its system at Mahanoy City and Shenandoah soon, involving an expenditure of about $100,000. The new substation at the old plant of the People's Lt., Ht. & Pwr. Co. is well under way. John S. Wise, Jr., of Hazelton, is manager.

READING, PA.—The City Council has appointed a committee to make investigations and secure estimates of the cost of installing a municipal electric-light plant.

READING, PA.—The Metropolitan El. Co., of Reading, has decided to rebuild on the Schuylkill River below Reading. The plant will have an output of 4000 hp. The Reading Transit Co. is closing a contract at Phoenixville for developing power on the Schuylkill at the point. The plant will have a generating capacity of 3200 hp. A contract for developing power at the Norristown dam is about closed, where over 3200 hp will be developed.

GALVESTON, TEX.—Sealed proposals will be received by John M. Murch, county auditor, Galveston, until March 11, for installing an ornamental lighting system on Galveston Seawall Boulevard, between Nineteenth and Twenty-seventh Streets, consisting of 57 ornamental standards carrying five-lamp clusters and eight ornamental arc lamp standards, together with all cable, lamps and other material necessary to make the installation complete as per plans and specifications, copies of which may be had on application.

RIVIERA, TEX.—The Riviera Beach Interurban Ry. Co. is preparing to construct an extension of its railway from Riviera to Falfurrias, a distance of about 15 miles.

OGDEN, UTAH.—The city commissioners and the Weber Club have ratified the joint contract for the installation and maintenance of an ornamental street-lighting system in the business district. The contract provides that one-half of the cost of the installation is to be paid by the Weber Club. The club is also to be responsible for one-half of the cost of maintenance of the system for the first year. The remaining half is to be paid by the Ogden Rapid Transit Co., which is to have free use of the poles for supporting the trolley wires. The Merchants' Lt. & Pwr. Co., in addition to supplying current, will furnish the arc lamps and keep the poles in repair. The Merchants' company is to receive $4.75 per lamp per month for furnishing electricity for the system.

BRISTOL, VA.—The contract for standards for the proposed ornamental street-lighting system has been awarded to the Union Foundry Co., of Anniston, Ala. The Aldermanic Board of Bristol, Tenn., has made arrangements with the local lighting company for the installation of an ornamental lighting system on the Tennessee side of the city.

DORCHESTER, VA.—Preparations are being made by the New York Mining & Manufacturing Co. for the erection of a power plant in Dorchester. The proposed plant will be equipped with four boilers with rating 500 hp each, generator and turbine engine. Contracts have been closed and work will begin immediately. M. S. Kemmerer, 143 Liberty Street, New York, N. Y., is president.

NORFOLK, VA.—Proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until March 22 for furnishing a three-wire direct-current engine-driven 125-kw generator at the United States Naval Hospital, Norfolk, Va. Estimated cost, $5,200. Plans and specifications may be obtained on application to the bureau or to the commandant of the navy yard. H. R. Stanford is chief of bureau.

RICHMOND, VA.—The Council committee on public buildings, properties and utilities has recommended to the City Council the installation of an ornamental lighting system for the entire downtown business section at a cost of $26,192 for installation and $5,438 per year for maintenance.

ASOTIN, WASH.—Work will begin at once on the construction of the proposed electric railway between Asotin and Clarkston, a distance of about 10 miles. The cost of the work is estimated at about $300,000. F. L. Strum, of Lewiston, Idaho, is interested.

BELLINGHAM, WASH.—The Stone & Webster Engineering Corpn., of Boston, Mass., is investigating the feasibility of building an electric railway north from Bellingham into the Nooksack Valley, and ultimately to Vancouver, B. C. The company also contemplates the construction of a railway from Mount Vernon southward to Everett, thereby closing the only missing link between this city and Tacoma.

BREMERTON, WASH.—The City Council has granted the Northwest Gas. El. & Wtr. Co. a 25-year franchise. The company will begin work at once on the construction of a plant to cost about $75,000.

CLE ELUM, WASH.—The Kittitas Ry. & Pwr. Co. is planning to erect a hydroelectric power plant near Salmon La Sac. The company recently purchased 1000 in. of water per second from J. V. Hoeffler.

ELBERTON, WASH.—Preparations have been made by the Washington Wtr. Pwr. Co., of Spokane, to connect this city with its main power line east of here.

EPHRATA, WASH.—A movement has been started for the installation of a municipal electric-light plant here.

NORTH YAKIMA, WASH.—The Yakima Valley Transportation Co. will begin work immediately laying track on the Selah extension of its system.

OLYMPIA, WASH.—Governor Lister and a special legislative committee which investigated the Celilo Rapids power project have recommended that the State of Washington appropriate $15,000 in aid of Oregon in an engineering investigation to determine whether the development of the proposition should be undertaken by the two States.

ORTING, WASH.—Plans are being prepared and estimates being received for establishing a municipal electric-light and power plant in Orting.

PASCO, WASH.—The City Council has entered into a contract with the Pacific Pwr. & Lt. Co. for the installation of cluster lamps, at $28 per standard per year.

TACOMA, WASH.—The City Council is considering the question of furnishing electricity for heating and cooking purposes at a very low rate. If this policy is adopted, new substation equipment will be required. At present the substation is equipped to handle only about one-half of the output of the La Grande plant. The cost of the new equipment is estimated at about $33,000.

TACOMA, WASH.—Plans are being considered for connecting the municipal electric-light plants of Tacoma and Seattle. The cost of erecting the transmission line is estimated at about $100,000. If the project is carried through it is proposed to furnish electricity to towns along the route. A. L. Thorn is superintendent of the Tacoma plant, and J. D. Ross is superintendent of the Seattle plant.

BERKELEY SPRINGS, W. VA.—The Cacapon Pwr. Co. has sold its power plant in Berkeley Springs and on Cacapon Creek to the Winchester & Washington City Ry. Co. The Cacapon Pwr. Co. furnishes electricity in Berkeley Springs, Great Cacapon and Hancock.

CHARLESTON, W. VA.—Sealed proposals will be received until March 28 at the office of the supervising architect, Treasury Department, Washington, D. C., for the installation, complete, of an electric elevator in connection with the extension of the United States post office and court house at Charleston, W. Va., in accordance with drawings and specifications, copies of which may be had at the above office.

JANESVILLE, WIS.—The State Street Advancement Association expects to be ready to proceed with the installation of the proposed ornamental street-lighting system on State Street in the spring. Approximately $7,000 has been raised among the property owners for the new system. It is proposed to erect ornamental standards on each side of the street and elminate the arc lamps at the intersections.

LONE ROCK, WIS.—A special election has been called for April 1 to vote on the proposition to issue $5,000 in bonds to build an electric-light plant.

NEENAH, WIS.—The Wisconsin Trac., Lt., Ht. & Pwr. Co. contemplates installing a new generator in its Neenah plant, increasing the output from 1000 hp to 1500 hp.

DUNCANS, B. C., CAN.—Bids will be received by the city clerk until March 13 for water turbines, generators, exciters, transformers and switching equipment. Specifications may be obtained from DuCane, Dutcher & Co., Rogers Building, Vancouver, B. C.

SOUTH VANCOUVER, B. C., CAN.—The British Columbia El. Co., of Vancouver, is contemplating extending the Davie street car system through from Twenty-fifth Avenue to the Fraser River Valley. A section of the proposed line will be built at once.

VANCOUVER, B. C., CAN.—The Western Canada Pwr. Co., of Vancouver, will extend its transmission lines at once to Milliardville to supply electricity for lamps and motors there.

BERLIN, ONT., CAN.—The Light Commission is planning extensions and improvements to the gas and electric departments involving an expenditure of about $70,000. Of this amount $35,000 will be expended for gas mains, increasing transformer capacity and service extensions in the electrical department.

BRECHIN, ONT., CAN.—The ratepayers have approved the by-law to enter into a contract with the Hydro-Electric Power Commission for Niagara power.

IROQUOIS FALLS, ONT., CAN.—The Abitibi Pulp & Paper Mills, Ltd., which is building a large paper mill at Iroquois Falls, on the Abitibi River, has obtained a lease of the water-powers of Iroquois Falls and Couchiching Falls, and also has the right to hold and control the waters of Abitibi Lakes for power purposes. Henry Holgate, of Montreal, has reported on the water-powers and estimates the total power available to be 57,195 shaft hp.

LONDON, ONT., CAN.—Announcement has been made by Adam Beck that three new hydroelectric transmission lines will be erected radiating from London this spring. The proposed lines will serve the agricultural districts and a number of small towns and villages. The first will run to Dorchester, Thorndale and Thamesford; the second will serve St. John's, Birr, Masonville, Lucan and other points, and the third will run from Hamilton Road station through Westminster, Lambeth, Delaware, Mount Brydges, Glencoe, Melbourne and Strathroy.

OWEN SOUND, ONT., CAN.—The Hydro-Electric Commission of Ontario has submitted a proposition to the town of Owen Sound, offering to furnish energy at $29 per hp per year, stepped down to a low voltage. It is expected that the town will contract for 1500 hp. If the offer is accepted, it is understood that work will begin at once on the development of Eugenia Falls and a transmission line erected from Eugenia to Owen Sound. F. F. Espenschied is engineer of the commission. J. R. McLinden is superintendent of the municipal plant.

TILBURY, ONT., CAN.—Steps have been taken to obtain electricity from the Hydro-Electric Power Commission.

WESTBORO, ONT., CAN.—The installation of an electric-light system in this village is under consideration.

OUTREMONT (MONTREAL), QUE., CAN.—The Town Council has announced that it proposes to establish a municipal electric-light plant. The plans include the building of underground conduits.

REGINA, SASK., CAN.—By-laws authorizing an expenditure of $2,750,000 were voted by the ratepayers on Feb. 25 for civic improvements, including extensions to street railway system, water mains, sewers, new electric light and power plant, new civic buildings, overhead bridge, etc.

REGINA, SASK., CAN.—Tenders will be received by the City Commissioners of Regina, Sask., until March 29, for electrical department supplies as follows: Section (1)—weatherproof copper wire; (2)—Western cedar poles; (3)—cross arms; (4)—top pins, insulators, etc.; (5)—pole-line hardware; (6)—pole-type transformers; (7)—integrating watt-meters, single, polyphase and two-phase; (8)—metal-flame arc lamps and station equipment; (9)—series cut-out mast arms for arc lamps; (10)—underground material; (11)—fire-alarm boxes and gongs; price to be f. o. b. Regina. Copies of specifications may be had from E. W. Bull, superintendent of light and power.

New Industrial Companies

THE EDEN SPECIALTIES CORPORATION, of New York, N. Y., has been incorporated by J. B. Kissam and B. Darrach, Jr., and F. E. Hazard, of New York, N. Y. The company is capitalized at $25,000 and proposes to manufacture and deal in electrical devices.

THE EQUIPMENT IMPROVEMENT COMPANY, of New York, N. Y., has been incorporated with a capital stock of $100,000 for the purpose of manufacturing signaling and safety devices. The incorporators are: Alexander Turner, Robert H. Weatherly and Frank H. Clark, all of 30 Church Street, New York, N. Y.

THE GLOBE ELECTRIC CO., of Philadelphia, Pa., has been incorporated by Casemir Kadzerra, Frank Strauss and Howard W. Thomas, all of Philadelphia, Pa. The company is capitalized at $25,000 and proposes to deal in electric motors, switchboards, etc.

THE HOT SPARK MAGNET COMPANY, of Los Angeles, Cal., has been incorporated with a capital stock of $10,000 by P. Riedele, A. T. Kwajel and Mary Riedele.

THE HURLEY ELECTRIC TOOL COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $5,000 to manufacture and deal in electric tools, machinery, etc., by Neil C. Hurley, L. E. Brigham and Walter T. Haynie.

New Incorporations

LOS ANGELES, CAL.—The Inyo County Wtr. & Pwr. Co. has been incorporated with a capital stock of $200,000 by Louis Luckel, L. A. Cronk and J. E. Pettijohn.

LAPORTE, IND.—The Laporte, Logansport & Southern Ry. Co. has been incorporated with a capital stock of $100,000 to construct and operate an electric railway from Laporte to Logansport. The company also proposes to supply electricity for lamps and motors through towns and communities along the proposed railway. The directors are: Warren W. Travis, P. O. Small, C. J. Loetz, R. N. Smith and Ora Bosserman.

FRANKFORT, KY.—The McKinney El. Co. has been incorporated with a capital stock of $2,000 by M. McKinney, Eugene Hoge and W. H. Hoge.

DENMARK, MAINE.—The Denmark Lt. & Pwr. Co. has been incorporated with a capital stock of $5,000. The officers are: Henry M. Cobb, president; Alfred P. Cobb, treasurer, and E. S. Cobb, clerk, all of Denmark.

FOSTORIA, OHIO.—The Fostoria El. Co. has been incorporated with a capital stock of $100,000 by Frank Espy, H. H. Henzy, James F. Loftus, Ralph A. Burgus and William N. Dore.

Trade Publications

CIRCUIT-BREAKERS FOR RAILWAY SERVICE.—Bulletin No. A4086 of the General Electric Company is devoted to the subject of circuit-breakers for railway service.

BELT DRESSING.—"Cling-Surface Treatment for Ropes" is the title of a bulletin just published by the Cling-Surface Company, Buffalo, N. Y. It shows a number of noteworthy examples of treated rope drives and gives accurate technical data.

AUTOMOBILE ACCESSORIES.—Catalog 1 has been issued by the Superior Lamp Manufacturing Company, 124th Street and First Avenue, New York. It contains brief illustrated descriptions of its electric headlamps, tail-lamps, dash-lamps and other automobile accessories.

FIXTURES.—In the "Fixtureman," issued by the Tungstolier Works of the General Electric Company, Conneaut, Ohio, is given much information on the latest developments in the fixture industry. The publication contains many suggestions that should prove of value to the fixture dealer.

SIGN RECEPTACLES.—Bulletin No. 760 issued by Pass & Seymour, Inc., Solvay, N. Y., contains sixteen pages devoted to brief descriptions and miniature illustrations of sign and outlet box receptacles and gives views of a number of prominent signs in various parts of the country using these devices.

WATT-HOUR METERS.—The Sangamo Electric Company, Springfield, Ill., is distributing Bulletin No. 34, descriptive of its complete line of single-phase and polyphase induction watt-hour meters. This bulletin has been arranged with particular reference to use by central-station meter superintendents desiring complete information on the latest metering developments.

REVERSING MOTORS FOR PLANERS, SLOTTERS, ETC.—In Bulletin No. A4081, issued by the General Electric Company, reversing motors for planers, slotters, etc., are treated in detail. The publication contains various curves which show the advantage of direct drive over belt drive and, therefore, the advantage of reversing motors. Various auxiliary appliances are also illustrated.

LIGHTNING ARRESTERS.—The Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, Pa., has issued a well-printed and excellently illustrated sixty-eight-page pamphlet on Garton-Daniels lightning arresters. It contains information on lightning phenomena, the construction, installation and operation of alternating-current and direct-current arresters, and the grounding and inspection of arresters.

PORTABLE LAMP WITH "EYE COMFORT" SYSTEM.—A novel variation of the "Eye Comfort" lighting system, in the form of the Curtis portable lamp, is the subject of a bulletin issued by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill. Some beautiful designs of table and floor pedestals for use with the "Eye Comfort" system are shown. These are especially suitable for libraries, drawing or music rooms.

PORTABLE ELECTRIC DRILLS.—The Standard Electric Tool Company, of Cincinnati, Ohio, has recently issued Bulletin D 8, describing the Standard high-power direct-current portable electric drills, and Bulletin D 9, performing a similar service for the Standard high-power alternating-current portable electric drills for two-phase and three-phase. The manufacturer claims that these drills represent the highest achievement in the development and construction of electric tools.

REVOLVATORS.—The New York Revolving Portable Elevator Company, Jersey City, N. J., has recently issued Bulletin No. 21, in which its motor-driven revolvators (portable tiering machines with a revolving base) are described and fully illustrated. The use of this apparatus increases the storage capacity of warehouses and stockrooms by from 20 to 50 per cent, as the revolvator will operate in cramped quarters and store material near the ceiling, utilizing space often unused because of its inaccessibility.

BOLTS.—The unlimited field of usefulness of bolts makes the twenty-page booklet of the United States Metal & Manufacturing Company, 165 Broadway, New York, of general interest. The Kling bolt is said to possess an entirely new feature, it being the only bolt on the market that will allow the head to pass through a hole of the same diameter as the stem of the bolt and at the same time give a firm anchorage for the head on the opposite side. It is especially adapted for all hollow construction work. The booklet illustrates a few of its many uses.

AUTOMOBILE LIGHTING GENERATORS.—A fourteen-page brochure issued by the Splitdorf Electrical Company, 98 Warren Street, Newark, N. J., entitled "New Lights for Old," explains its contents in its sub-title: "A Modern Call to Owners of Automobiles, Motor Trucks and Motor Boats in Behalf of Splitdorflite, an Electric Lighting Generator." It gives, by means of illustrations of the device, curves and diagrams and clear descriptions, detailed information regarding this new method of lighting automobiles, motor trucks and motor boats.

WIRING CALCULATING DEVICE.—A wiring computer which will be of interest to electrical engineers and wiremen is being distributed by the Simplex Wire & Cable Company, 201 Devonshire Street, Boston. It is mounted on stiff thick celluloid of a convenient pocket size. By a single setting of the computer the following results may be obtained: The size in B. & S. gage of a wire is readily determined by setting the disk to correspond to a given distance of distribution for a desired

voltage drop and the current which the wire is to carry; or if the size of wire is given, the current to be carried and the distance of transmission can be determined. The resulting voltage drop may be read directly upon the computer. In the same manner the current may be found by one setting for a desired voltage drop with a definite sized wire and distance of transmission. Finally, the distance to correspond to specific conditions of voltage drop, the current and size of wire may be found by a single setting of the disk. The setting of the disk is very simple and directions for attaining these four different results are given on the foot of the card. On the reverse side are handy tables of wiring data and conversion factors.

Business Notes

RICHMOND ELECTRIC WORKS is the new name of the Richmond Electric Company, Richmond, Va. This change took place recently.

THE AMERICAN ROTARY VALVE COMPANY, now at 156 North Dearborn Street, Chicago, successor to the Jenney Electric Manufacturing Company, will move its office to the fifteenth floor of the new Fulton Building, on the corner of South State Street and East Jackson Boulevard, Chicago.

THE HURLEY MACHINE COMPANY, Clinton and Monroe Streets, Chicago, has installed in the new $25,000 Woodward Avenue residence of Mr. Lem Bowen, Detroit, Mich., one of its No. 3 white-enamel Thor electric washers, a 48-in. electric ironer, and a five-rack Thor Solar clothes drier. This is a model up-to-date domestic laundry installation and cost $705.

LOCKWOOD, GREENE & COMPANY, architects and engineers, 60 Federal Street, Boston, have opened a New York office at 320 Fifth Avenue, in charge of Messrs. Frank A. Wing and John M. Toucey. This is the third branch office of Lockwood, Greene & Company, the firm having besides a Southern and a Western office, located at Atlanta and Chicago, respectively.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED FEB. 25, 1913.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,053,977. ELECTROGALVANIC GENERATOR; A. Dow, Wooster, Ohio. App. filed Jan. 5, 1912. An open battery casing for electrotherapeutic diffusion.

1,053,981. LOCOMOTIVE; D. T. Fisher, Columbus, Ohio. App. filed April 16, 1910. Gearless mine locomotive with large armature and short wheelbase.

1,053,997. TELEPHONY; M. L. Johnson, Chicago, Ill. App. filed Aug. 10, 1911. Relay for preventing operators from listening.

1,053,998. TELEPHONE EXCHANGE SYSTEM; M. L. Johnson, Chicago, Ill. App. filed Aug. 10, 1912. Preliminary connection for prepayment instrument.

1,054,005. DECARBONIZATION OF RAW METALLIC FILAMENTS FOR INCANDESCENT ELECTRIC LAMPS; A. Lederer, Vienna, Austria-Hungary. App. filed May 29, 1909. The raw filament is heated in a partial vacuum.

1,054,031. ELECTRIC RECEPTACLE; N. D. Rand, West Camp, N. Y. App. filed Jan. 9, 1908. Porcelain-lined wire connection.

1,054,047. FIELD MAGNET AND WINDING FOR ELECTRICAL MACHINES; C. H. Smoot, Chicago, Ill. App. filed Feb. 16, 1907. Compensated-field direct-current dynamo.

1,054,061. TROLLEY CATCHER; P. N. Van Epp, Port Clinton, Ohio. App. filed Feb. 2, 1911. Automatic pole-retracting mechanism.

1,054,063. CARBON HOLDER FOR ARC LAMPS; M. C. Warren, Coffeyville, Kan. App. filed Aug. 10, 1911. Clamp for two parallel carbons.

1,054,068. INCLOSED FUSE; H. R. Williams, Hartford, Conn. App. filed Dec. 15, 1911. Multiple-strip type of cartridge with fuse strips interwoven with asbestos.

1,054,092. TROLLEY; A. Daszko and A. Bielech, Chicago, Ill. App. filed Oct. 9, 1912. Spiral replacing grooves.

1,054,110. ELECTRIC SWITCH; M. Guett, Hartford, Conn. App. filed Jan. 2, 1909. Rotary snap radial detent.

1,054,111. SWITCH; M. Guett, Hartford, Conn. App. filed Dec. 12, 1911. Mounting for rotary snap indicator.

1,054,115. CIRCUIT-BREAKER; F. Heath, San Diego, Cal. App. filed March 29, 1911. Railway track attachment operated by a car.

1,054,133. SYSTEM OF ELECTRICAL DISTRIBUTION; D. B. Moist and C. W. Young, Harrisburg, Pa. App. filed April 23, 1908. Automatic connection of sectional system.

1,054,138. MEANS FOR ATTACHING WIRES AND CABLES TO INSULATORS; H. Parra, Toulouse, France. App. filed April 27, 1912. Wire attachment collar.

1,054,144. SYSTEM OF MOTOR CONTROL; J. H. Sandidge, Chicago, Ill. App. filed Nov. 22, 1911. Control and reversal of direct-current motors.

1,054,148. HIGH-VOLTAGE STRAIN INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed April 4, 1910. Interlocked and insulated links.

1,054,176. TELEPHONY; E. R. Corwin, Chicago, Ill. App. filed April 24, 1911. Semi-automatic system with means for preventing interference.

1,054,212. CONTACT FOR SCREW PLUG FUSES; W. Klement, E. Kohrs and C. Leichtenschlag, Charlottenburg, Germany. App. filed Aug. 2, 1919. Conical-spring washer contact support.

1,054,227. GROUND-WIRE CONNECTOR; F. E. McKenna, Wauwatosa, Wis. App. filed June 30, 1911. Pipe strap.

1,054,257. VAPOR-ELECTRIC APPARATUS; P. H. Thomas, Montclair, N. J. App. filed Nov. 22, 1906. Plurality of lamps in series under constant potential system.

1,054,267. RAILWAY SIGNAL APPARATUS; D. Baker, Los Angeles, Cal. App. filed Feb. 9, 1912. Bridge system to indicate rise of water.

1,054,275. TELEPHONE SWITCHBOARD; P. C. Burns, Chicago, Ill. App. filed Dec. 5, 1907. Removable-unit system of jacks.

1,054,277. SYSTEM FOR PROTECTING TRAINS; G. Carboni and C. Tironi, Florence, Italy. App. filed Jan. 12, 1910. Sectional conductors besides the railroad track.

1,054,318. ELECTRICALLY HEATED LIQUID RECEPTACLE; E. Schwartz, Chicago, Ill. App. filed Feb. 24, 1912. Connecting the heater to the receptacle.

1,054,330. NO-VOLTAGE CIRCUIT-BREAKER FOR ALTERNATING CURRENT; C. C. Badeau, Boston, Mass. App. filed July 27, 1909. To prevent humming.

1,054,336. ELECTRIC WRITING SIGN; H. D. Brown, Los Angeles, Cal. App. filed June 12, 1911. Keyboard-operated controlling system.

1,054,368. ELECTRIC AND AUTOMATIC CONTROL OF ENGINES, DYNAMOS AND BATTERIES; L. Sunderland and G. C. Pillinger, Westminster, London, Eng. App. filed Nov. 17, 1910. Gas engine and storage battery, dynamo combination.

1,054,371. ELECTRIC FURNACE; F. J. Tone, Niagara Falls, N. Y. App. filed March 26, 1912. Temperature equalization in manufacturing silicon-carbide articles.

1,054,372. PROCESS OF SILICIDIZING; F. J. Tone and T. B. Allen, Niagara Falls, N. Y. App. filed Sept. 17, 1912. Carbonaceous articles are subjected to silicon vapor in an electric arc.

1,054,378. METHOD OF SILICIDIZING ARTICLES CONTAINING CARBON; F. J. Tone, Niagara Falls, N. Y. App. filed March 26, 1912. Special arrangement of the articles.

1,054,379. ELECTRIC BELL MECHANISM; G. B. Wurster, New York, N. Y. App. filed April 26, 1912. Single stroke with multiplied action.

1,054,380. ELECTRIC FURNACE; T. B. Allen, Niagara Falls, N. Y. App. filed April 24, 1912. Resistance type for manufacturing silicon-carbide articles.

1,054,409. HEATING APPLIANCE; A. F. Harrison and O. L. Peard, Weybridge and Croydon, England. App. filed Sept. 19, 1912. Heat-storage reservoir system.

1,054,419. INCANDESCENT-LAMP SOCKET; B. H. Irish, Peru, Ind. App. filed Nov. 3, 1910. Yielding center-lamp contact.

1,054,421. RAILWAY SIGNAL; E. Jennings, Windsor, Ontario, Canada. App. filed June 21, 1909. Mechanical block system.

1,054,455. WATERPROOF INCANDESCENT ELECTRIC LAMP SOCKET; E. L. Schneider, Syracuse, N. Y. App. filed June 19, 1911. Porcelain and connections.

1,054,469. HIGH-VOLTAGE STRAIN INSULATOR; L. Steinberger, New York, N. Y. App. filed April 4, 1910. Insulated interlocking links.

1,054,494. BURGLAR ALARM; J. V. Bellamy, Vancouver, British Columbia, Canada. App. filed Oct. 1, 1912. Mechanically operated switch.

1,054,497. APPARATUS FOR THE ELECTROLYSIS OF SALT SOLUTIONS; J. Pilliter, Vienna, Austria-Hungary. App. filed March 30, 1912. Circulation and purification of electrolyte.

1,054,520. HAIR SINGER; E. H. Eldridge, Corpus Christi, Tex. App. filed Nov. 4, 1912. It carries off the smoke.

1,054,559. AUTOMATIC FUSE BLOCK AND RELAY PROTECTOR; T. B. Jones, Dome, Arizona. App. filed Nov. 4, 1912. Automatic ground and replacement.

1,054,581. TELEPHONIC TRANSMITTER, W. J. Marchant, London, Eng. App. filed Aug. 31, 1911. Parabolic section.

1,054,583. APPARATUS FOR CLOSING AN ELECTRIC CIRCUIT AT PREDETERMINED POSITIONS OF A COLLECTOR; E. M. v. Marchthal, Vienna, Austria-Hungary. App. filed March 18, 1912. For typewriting, setting, casting, etc.

1,054,589. DEVICE FOR THE PRODUCTION OF PURE AIR; H. Mestern, Berlin, Germany. App. filed July 5, 1911. The air is ozonized and moistened.

1,054,622. APPARATUS FOR THE OPERATION OF ELECTRICAL CLOCKS BY ELECTRIC WAVES; F. Schneider, Fulda, Germany. App. filed April 3, 1912. Highly sensitive receiving apparatus.

1,054,624. AUTOMATIC FIRE ALARM; H. R. Schirley, Phœnix, British Columbia, Canada. App. filed Feb. 21, 1912. Mercury column circuit closer.

1,054,647. SILICA-GLASS ELECTRIC APPLIANCE; H. A. Kent and H. G. Lacell, Bound's Green and Finchley, England. App. filed Nov. 21, 1912. Molybdenum leading-in wire.

1,054,652. LAMP SOCKET; S. Trood, New York, N. Y. App. filed March 5, 1912. Unipolar socket or plug.

1,054,653. CIRCUIT-CONTROLLING APPARATUS; L. H. Thullen, Cincinnati, Ohio. App. filed May 16, 1904. Railroad signaling system with alternating current.

13,534 (reissue). ELECTRICAL DISTRIBUTING SYSTEM; R. C. Leake, Auburn, N. Y. App. filed May 12, 1909. Selective system. (Original patent No. 853,888, May 14, 1907.)

13,535 (reissue). PROTECTIVE COVERING FOR ATTACHMENT PLUGS; M. R. Rodrigues, New York, N. Y. App. filed Jan. 3, 1913. Metal-coated composition. (Original patent No. 1,040,762, Oct. 8, 1912.)

13,538 (reissue). MANUFACTURE OF STEEL; W. R. Walker, New York, N. Y. App. filed Dec. 30, 1912. Re-carbonizing and electric-furnace treatment.